State of Food Security & Nutrition in Bangladesh 2010

FOOD SECURITY & NUTRITION SURVEILLANCE PROJECT

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In addition to promoting integration within Europe, the European Union is one of the biggest development aid donors in the world. The EU's food security policy seeks to increase the availability of food, improve households' access to food, enhance food use and nutrition, and strengthen crisis prevention and management. It also supports the formulation of national and regional food security policies.

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FOOD SECURITY & NUTRITION SURVEILLANCE PROJECT

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Foreword

William Hanna, Ambassador, Head of Delegation of the European Union to Bangladesh

The European Union (EU) has been a development partner of Bangladesh since 1973, providing significant financial support to assist the Government. I am pleased that the EU-financed National Food Security Nutritional Surveillance Project is publishing the results of the first three rounds of surveillance. The purpose of this project is to monitor the nutritional status of the population in order to provide decision-makers with the information they need for policy formulation. Through this project, the Bangladesh Bureau of Statistics, BRAC University and Helen Keller International are also strengthening capacities. I am happy to see that the initial findings of this project are already being used by the development community. I hope that the quality data produced by the project will help improve food security in Bangladesh.

Naser Farid, Director General, Food Planning and Monitoring Unit, Ministry of Food and Disaster Management, Government of the People's Republic of Bangladesh

Reliable and timely data are required for the Food Planning and Monitoring Unit's (FPMU) work in delivering evidence-based policy advice to the Government. The Food Security Nutrition Surveillance Project (FSNSP) has been and will be a vital source for information on food security and nutrition. In its first year of implementation, the data collected by FSNSP has been utilized in the FPMU Food Situation Reports to highlight nutritional deficits faced by vulnerable segments of the Bangladeshi population. In the coming year FSNSP data will be made available to policy makers and food security analysts through the common electronic networks being established by FAO National Food Policy Capacity Strengthening Programme (NFPCSP). In addition, the FSNSP surveillance system will assist in monitoring our nation's progress towards the goals laid out in the Country Investment Plan.

Dr. Khondhaker Md. Sefyetullah, Director General, Health Services, Ministry of Health & Family Welfare, Government of the People's Republic of Bangladesh

I am delighted that the national Food Security Nutritional Surveillance Project (FSNSP) is publishing their first report on the food security and nutrition situation of Bangladesh in 2010. FSNSP is the only surveillance system in Bangladesh that provides credible, routine and timely evidence to inform advocacy efforts, policy making and planning, early warning, and monitoring and evaluation. A joint effort between BRAC University, Helen Keller International and Bangladesh Bureau of Statistics, each institution brings unique and important strengths to the collaboration. I hope that FSNSP continues its good work in tracking trends in food insecurity and nutrition in Bangladesh.

Key findings and recommendations

The Food Security and Nutrition Surveillance project (FSNSP) is the only surveillance system in Bangladesh to provide nationally representative estimates of food security and nutrition. Using state-of-the-art methods and indicators, the system provides up-to-date evidence on the food security, nutrition and health status of women and children, to support the design, implementation and evaluation of national strategies and assess progress towards internationally agreed development targets such as those of the Millennium Declaration Goals (MDGs).

Food security

During 2010, over sixty percent of households suffered food insecurity, and at least 10 million children lived in food insecure households, over a third of whom were exposed to situations in which extreme coping behaviours like skipping meals were employed. The significant increase in food insecurity between the periods from January to April and June to August represents about 2 million more children living in food insecure households and almost 1.5 million more children living in households experiencing severe food shortage.

Food insecurity was significantly more prevalent in poorer households and in those with less educated mothers; over 80% of households in the lowest wealth quintile were food insecure compared to just 13% in the wealthiest households. The high prevalence of household food insecurity is marked by significant seasonal and geographic variation which defies any simple and singular national pattern. This underlines the importance of targeted, tailored, and timely intervention strategies that prevent and mitigate household food insecurity in a manner that is specific to the realities of different seasons and geographic areas.

In the latter half of 2010, dramatic and disproportionate increases in food prices, which outstripped the growth in daily labour rates, exacerbated food insecurity. This emphasizes the growing vulnerability of households to food inflation spanning not only the rice staple but also other important foods. While the Government of Bangladesh has instituted several schemes to attempt to mitigate the food insecurity impacts of high prices such as the Open Market Sale (OMS) of rice, they appear to have had limited effectiveness in 2010. Further consideration of how best to buffer the impact of food inflation as well as to address its causes is urgently needed.

Maternal nutrition

Maternal nutrition and adequate care during pregnancy are well recognized to improve nutrition and health outcomes of mothers and children. Yet despite clear improvements in maternal and child mortality, maternal care practices and nutrition are lagging behind. FSNSP findings indicate that few mothers have obtained adequate care during pregnancy and that maternal malnutrition is widespread. Over a quarter of mothers in Bangladesh are chronically energy deficient and over 60% do not consume adequate micro-nutrients. This situation is much worse amongst poorer and more food insecure households. In highly food insecure households an alarming proportion of mothers report a deliberate reduction in the quality and/or quantity of their diet despite the fact that many are breastfeeding and thus experiencing greater caloric and nutrient requirements. However, even among the wealthiest quintile of households there is evidence for concern with over one-tenth of women underweight and over a third consuming a diet inadequate in micronutrients.

From examining FSNSP data in relation to past surveys it is evident that while more mothers are attaining calorie sufficiency compared to previous years, a downside of this trend is a steady increase in rates of

maternal overweight and obesity. During January to April, equal proportions of mothers were undernourished and overweight. However, even though overweight mothers have more than attained caloric sufficiency, at least half still eat a diet which lacks adequate micronutrients.

Child nutrition

Bangladesh has made slow progress in alleviating its high prevalence of child malnutrition. Of particular concern are high rates of stunting, or chronic child malnutrition (45%), impacting over 7 million children under the age of five. Acceleration in the rate of reduction of child malnutrition is required to enable the country to reach the MDG 1 goal to reduce child hunger by one-half. Increased action is urgently required, especially scaling up existing interventions that target the most vulnerable.

FSNSP findings serve to justify increased investment in interventions that will impact areas of care that are lagging behind. For example, more attention needs to be given to supporting mothers during pregnancy and their child's infancy. Indicators of proper feeding practices for children have not changed dramatically in recent years. Almost half of infants in Bangladesh (49%) are not exclusively breastfed and the rate of exclusive breastfeeding in 2010 is only 7 percentage points higher than the historical average (1; 2; 3; 4; 5). Worryingly, the proportion of mothers practicing early initiation of breastfeeding (40%) appears to be falling (1; 2; 3; 4; 5). Similarly, the harmful practice of pre-lacteal feeding shows no signs of abating and affects over fifty percent of infants.

Another intervention area that needs to be prioritized is the support of households with young children who are beginning to eat complementary foods. While the proportion of six to eight month old children being fed solid and semi-solid foods has greatly increased in the last decade (from 59% to 89%), the quality of food given, as measured by diversity of diet, is lacking. Less than half of the children aged 6-23 months are being fed iron-rich foods or an adequately diverse diet (42% and 38%, respectively).

Also hampering progress are seasonal spikes in wasting (acute malnutrition). In 2010, rates of wasting doubled between the periods of January to April and June to August (8% to 16%). Acute malnutrition could be prevented by designing and implementing community-based programs to improve child feeding practices, as per WHO recommendations, while treating moderate and severe acute malnutrition. In addition, investments in improved sanitation, water facilities, and programs to increase hand washing and household hygiene are needed to reduce child illness and its effects on nutrient absorption.

Finally, the importance of maternal nutrition to child nutrition, health and development cannot be stressed enough. Maternal malnutrition not only greatly increases the risk of low birth weight children, it predisposes children to significant physical and cognitive compromise that limits educational achievement and increases risk of chronic disease later in life. The multi-factorial investments necessary to achieve maternal and child nutrition security in Bangladesh require a long-term commitment that will extend well beyond the 2015 target date of the MDGs but that must be the focus of more concerted and urgent action beginning now.

The value of surveillance

Questions about what is impeding accelerated improvements in child and maternal nutrition in Bangladesh can only be answered in the presence of a surveillance system that continuously

captures changes in health and nutrition indicators and the range of micro- and macro-variables known to influence them. For all of the primary outcomes of concern - food security, maternal, and child nutrition - 2010 FSNSP results provide critical insights that underscore the importance of national surveillance. Across divisions, districts, and food insecure zones, the different patterns of food insecurity and malnutrition identified are indispensable to informing priorities, guiding implementation, and evaluating interventions. It clearly matters not only where you measure but also when you measure given the dramatic seasonal variation documented in 2010. Perhaps most important is how the surveillance system has helped illuminate the pervasive inequities in food security and nutrition related to lower household wealth, less maternal education and gender relations more broadly. Tracking these higher risk groups over time will help to focus and target investments with respect to food security and nutrition. Moreover, sustained surveillance efforts of this nature should inform critical complementary development investments in education and social protection such that the prospect of equal opportunities and equitable outcomes for food security and nutrition in Bangladesh becomes a reality.

Nutrition and food security in Bangladesh

Launched in 2009, the Food Security and Nutrition Surveillance Project (FSNSP) was designed to inform policy-makers about the level and distribution of food insecurity and malnutrition in Bangladesh. The extensive sample covered by FSNSP (more than 23,000 households and 26,000 children in 2010) and the implementation of rigorous systems of quality control ensure data of exceptional precision and validity. FSNSP is the only data source in Bangladesh that provides nationally representative data on food security, nutrition and health indicators on a seasonal basis, thus facilitating timely and context-specific delivery of services and programmes to those most in need. FSNSP also facilitates tracking progress in meeting national development goals and guiding the allocation of government and development budgets for food security and nutrition programmes.

While some progress has been made towards achieving the indicators in Millennium Development Goal 1 of eradicating extreme poverty and hunger, Bangladesh continues to have "very high" malnutrition prevalence rates based on WHO standards (6;7). According to the latest previously published data:

- 47% of pregnant Bangladeshi women are anemic (8)
- 40% of infants are born with low birth weight (9)
- Only 64% of infants less than two months old are exclusively breastfed (5)
- 43% of children under five years of age are chronically malnourished and more than 17% are acutely malnourished (5).

Although these figures represent improvements in nutritional status compared to the situation two decades ago, these gains pale in comparison to the dramatic decline in child mortality that occurred during the same period. This differential is all the more perplexing given the known relationship between nutrition and mortality reduction and the assumption that the benefits of public health actions to improve child survival would also improve nutritional status (10;11;12).

Explanations for the remarkable decline in mortality in Bangladesh range from overall improvement in the economy and decreased levels of poverty, reduction in fertility rates and increased access to health care and primary health services, all of which would be expected to benefit nutrition. With respect to food availability, national aggregate figures for food grain production suggest sufficient food availability to meet consumption needs of the country. Moreover, all of these positive developments have occurred contemporaneously with active nutrition programming by the government and its development partners over the past two decades. What then is impeding accelerated improvements in child and maternal nutrition in Bangladesh? By all accounts, such a question can only be answered in the presence of a surveillance system that continuously captures changes in health and nutrition indicators and the range of micro- and macro-variables known to influence them. FSNSP is designed to help fill this gap.

In addition, new challenges are presenting themselves that have serious implications for nutrition and food security in the country including:

- **Rising food prices:** Escalating international food and fuel prices, combined with weak national markets and distribution systems, have resulted in alarming rates of food inflation in Bangladesh

– reaching 10% in 2010 and steadily increasing through 2011. The implications of food inflation are devastating for the 60 million Bangladeshis who live on less than one dollar a day and spend 70% of their income on food.

- **Increasing population and urbanization**: Although fertility declines have been dramatic in Bangladesh, population size continues to increase alarmingly and is likely to exceed 217 million by the year 2050. Population growth of this magnitude will create tremendous pressures on agricultural production, the environment and urban and rural food security and nutrition. One percent of cultivable land is lost each year to encroachment of urban settlements, industry and infrastructure – pressures that are unlikely to diminish (13).
- **Climate change and disasters**: Global warming and rising sea levels may also impact adversely on agricultural production due to increased soil salinity and provoke substantial climate migration. Already prone to natural disasters, climate change in Bangladesh may exacerbate the frequency of cyclical flooding and cyclones and further undermine food security and nutrition of vulnerable households. Monitoring these developments through surveillance will be increasingly important. Moving forward, it is imperative that these challenges be addressed comprehensively to ensure rapid reduction in malnutrition in Bangladesh. Current global consensus is that proven interventions exist, yet implementation barriers – such as lack of integration with other sector programmes and insufficient attention to context in identifying and scaling up responses – are impeding the achievement of sustainable improvements in coverage and outcomes.
- **Changing diet and lifestyle:** The limited diversity of diets together with increasing urbanization and associated changes in lifestyle are provoking an increase in the prevalence of overweight, obesity and chronic disease in the country (5;14).

Bangladesh is a signatory and active participant in several global campaigns that seek to accelerate progress in reducing malnutrition. One of these campaigns is the framework and roadmap for Scaling Up Nutrition (SUN), which was prepared and endorsed in 2009-2010 by representatives of governments, donor agencies, civil society, research community, the private sector, intergovernmental organizations and development banks (15;16). Among other actions, SUN calls for a multisectoral approach to nutrition prevention that features enhanced commitment and coordination between stakeholders.

FSNSP provides an important means of tracking goals associated with these critical global and national policy initiatives, and will be a valuable monitoring tool in moving forward. For example, estimates from FSNSP for the feeding and care practices of children as well as the nutritional status of women and children are being used to monitor the progress of programmes outlined in the recent Country Investment Plan (17), a document that supports the implementation of the National Food Policy and its Plan of Action (18).[1]

1. The country investment plan provides guidance for program planning in order to ensure that resources invested address the three dimensions of food security and increase the intersectoral coordination between GoB ministries and multiple external funders. As part of this planning process, the document also sets goal and benchmarks in food security and nutrition for the country to meet.

Food security and nutrition surveillance

Derived from the French verb "surveiller" or "to keep watch", food security and nutrition surveillance refers to the systematic monitoring of the food and nutrition situation of populations at risk. It is undertaken for three distinct reasons: 1) to aid in advocacy and long-term planning for health and agricultural development; 2) to inform programme design, management and evaluation, and 3) to give timely warning of nutritional and food security crises requiring intervention (19).

Potential users of food security and nutritional surveillance data range from government, donors, civil society, and academia in sectors as diverse as agriculture, rural development, urban planning, health and social welfare. For example, in agriculture and rural development, surveillance data can reveal unintended impacts of policy decisions regarding what is produced, and by whom. In health, the spatial or seasonal distribution of malnutrition can help justify, plan and deploy health care resources, and evaluate the impact of health programmes. Surveillance data can also be used to identify areas or occupational groups with high malnutrition prevalence that merit high priority for social protection or nutrition interventions.

16 years of national surveillance

Bangladesh boasts one of the longest running nutrition and food security surveillance programmes among low-income countries. Launched in 1990 by Helen Keller International (HKI) in partnership with the Institute of Public Health and Nutrition and local non-governmental organizations (NGOs), the National Surveillance Programme (NSP) was originally designed to monitor the impact of disasters and the effectiveness of relief and rehabilitation programmes in disaster-prone areas of Bangladesh. In 1998 NSP was redesigned to include upazilas from all over the country in order to provide regular information on the national health, nutrition, and food security situation.

After a brief reprieve during 2006-2009, surveillance activities resumed in January 2010 under the National Food Security and Nutritional Surveillance Project (FSNSP). Supported by the European Commission, FSNSP is tasked to track key food security, nutrition and health indicators three seasons of the year for at least five years and to build national capacity to sustain the system in the future. A joint effort by the James P. Grant School of Public Health (JPGSPH) of BRAC University, Helen Keller International (HKI) and the Bangladesh Bureau of Statistics (BBS), FSNSP is designed to respond to the needs of stakeholders at the forefront of food security and nutrition decision making in the country. Government, academic institutions, NGOs, and donor organizations were explicitly engaged in the design phase of the project to generate demand for surveillance data in planning, monitoring and targeting and to ensure that the surveillance system was responsive to their information needs.

What FSNSP offers

The roll-out of the new Health, Nutrition and Population Sector Development Programme (HNPSDP), which includes a major mainstreaming nutrition effort, calls for investments in strong monitoring and evaluation systems to ensure that available resources are best utilized and that investments have optimal returns. FSNSP provides a rigorous population-based monitoring and evaluation platform that supports these goals and offers a means to track progress in achieving MDG 1.

Using state-of-the-art methods and indicators, the system provides up-to-date evidence on food security, nutrition and the health status of women and children. The data collection system is designed to do the following:

1.) Identify which types of households are most vulnerable to food and nutrition insecurity in Bangladesh according to geographic location and household characteristics

2.) Estimate the number of households and the number of individuals who live in households that are food and nutrition insecure, either seasonally or year round

3.) Appraise the severity of food and nutrition insecurity in the country

4.) Predict which households, by demographic characteristics or geographic location, will be at increased risk of food and nutrition insecurity in the near future.

Efforts to link the surveillance system with meteorological, food production and price data at regional and national levels are currently underway. This is being done to facilitate early warning of impending production shortages so that mitigation strategies can be organized to minimize likely nutritional and food security impacts. Information gained through this system is available for advocacy, resource mobilization, planning processes, programme and policy monitoring and evaluation and disaster warning and post assessment.

Conceptual framework

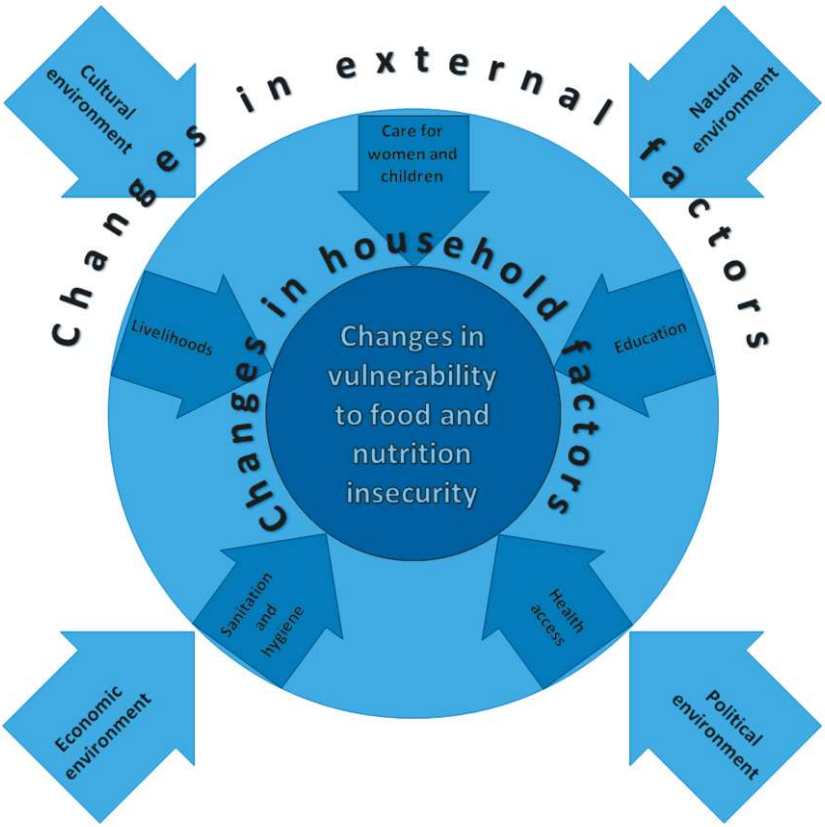
FSNSP was designed as a dynamic system. While it provides static estimates three times a year, its aim is to measure the change in household vulnerability between two rounds or to assess national-level differences in development indicators between two years. The conceptual framework guiding the programme design is presented in Figure 1.[2] As indicated in the innermost circle, the central objective of the surveillance system is to detect changes in household vulnerability to nutrition and food insecurity. It does so by directly monitoring indicators of food insecurity and malnutrition, examining related variations in household-level factors and establishing links with data sources that measure change in the external factors listed outside the circles in the framework.[3]

As FSNSP continues to operate, the system's ability to predict future trends in food insecurity and to identify factors associated with increased vulnerability to food and nutrition insecurity will improve. In this first year of implementation, FSNSP provides estimates of the numbers and characteristics of food insecure households in Bangladesh. By the third year of surveillance, FSNSP will be able to establish relationships between environmental, geographic, socioeconomic and household-level factors and forecast vulnerability to food and nutrition insecurity.

2. This framework was adapted from a FIVIMS framework (59).

3. External data sources identified include economic data from macroeconomic reports, BBS's Household Income and Expenditure survey, rain and weather data from meteorological services, and production data from agricultural reports, as well news media and regular health surveys like BDHS that capture cultural and policy changes, and associated health effects.

Figure 1: Conceptual framework



Structure of this report

This report on the *State of Nutrition and Food Security in Bangladesh 2010* presents selected national, zonal and district-level findings from the first three seasonal rounds of data collection under FSNSP. Following a brief review of current nutrition and food security challenges and opportunities in Bangladesh, the report reviews the history of FSNSP and the procedures and methods utilized in data collection, followed by surveillance results organized around four thematic headings: 1) background characteristics; 2) household food insecurity; 3) maternal care and malnutrition; and 4) child care and malnutrition. Under each theme, nationwide estimates are presented based on data collected from January to April 2010. Seasonality is captured by comparing estimates from three rounds of data collection in food insecure zones, and district level variation is explored by generating annual estimates from data aggregated from all three rounds.

While this report presents findings based on a selected subset of key indicators available in the surveillance system, the companion book, *State of Nutrition and Food Security in Bangladesh: Summary Statistics,* provides a more complete compendium of tables representing the full range of indicators collected by the system. For government stakeholders, estimates drawn from these datasets will be available for analysis through the National Food Policy Capacity Strengthening Programme (NFPCSP) workstation currently being developed by the Food and Agriculture Organization of the United Nations (FAO) (20). Aggregates from more recent surveillance rounds can be found at the project website, www.fsnsp.net.

Methods

This section describes the methodology guiding the development and implementation of the surveillance system in its first year of operation. In particular, it highlights lessons learned from efforts to streamline the surveillance system to ensure its logistical and financial viability and to strengthen its technical basis and relevance to decision makers.

Key indicators

Whenever possible, FSNSP uses standardized and internationally validated indicators drawn from technical support and academic resources. Indicators are selected to measure household socioeconomic and demographic characteristics, household food security and the nutritional status and care practices of children under-five years of age and their mothers.

Background characteristics

This report presents indicators of food insecurity and nutrition by the following characteristics:

Maternal education: The number of years of education completed by mothers of children under five categorized into five groups using standard cut-off points: no education (0), partial primary (1-4), primary completion (5), partial secondary school (6-9), and secondary completion or further study (10 or more).[4]

Occupation of main income earner: FSNSP recorded the main income-earning occupation of each household member and each household was asked to identify its main income earner. The eight most common occupations are listed in this report.

Wealth index: A composite wealth index was designed based on standard DHS techniques.[5] The wealth index was then divided into five quintiles, each containing an equal population of household members.

Food security

A household is food secure when: 1) food is available in an area (availability); 2) when a household is able to purchase or produce food (access); 3) when food is consumed equitably by all members of the household in light of their nutritional needs (utilization), and 4) safeguards are in place to ensure that this situation will not change in the near future (vulnerability) (21). To estimate the prevalence of food insecurity, FSNSP uses internationally standardized scales that measure changes in the food access patterns of households and household members.

Household food insecurity access scale (HFIAS): Developed through the FANTA-2 project, HFIAS is based around the premise that some coping responses to inadequate food access are more serious than others and indicate a household is more food insecure. Households are categorized based on the most "severe" coping mechanism they have employed to deal with inadequate access to food. The

4. Because higher secondary and tertiary degrees were obtained by less than 4% of mothers, these categories have not been separated from a ten-year degree (HSC).

5. The variables included in the wealth index are: drinking water source (tube well, piped water, well, or surface water), access to electricity, and ownership of any of the following assets solar panel, radio, TV, telephone, mobile phone, cot, cabinet, refrigerator, table/chair, watch/clock, bicycle, motorcycle, motor boat, rickshaw/rickshaw van, power tiller, shallow machine, and fishing net. The continuous variables are: number of cows, sheep/goats, and chicken/ducks owned.

results of this scale are not comparable across cultures but can measure changes within a culture over time (22; 23).

Household hunger score (HHS): Also from the FANTA-2 project, the HHS – which is created from the most severe subset of questions in the HFIAS – is an indicator of household food scarcity that has been validated for use in comparing food access across cultures (23).[6]

Coping strategies: Respondents were asked selected questions from the Coping Strategies Index (24; 25).

Food prices: Market prices of food commodities are collected from markets in every mouza/ward. The cost of the average daily amount of each item, as reported in the *Report of the household income & expenditure survey 2005* (26), is added together to create the price of the commodity portion of the average daily, per capita Bangladeshi food consumption basket.[7]

Maternal care and malnutrition[8]

A woman's nutritional status is a complex function of her food consumption habits and her overall level of health as determined by the interaction of her individual characteristics, care and food consumption habits from childhood, past illnesses, and past demands on her body, including the frequency of pregnancy. Furthermore, a mother's health and nutrition status affects the health and nutrition status of her offspring (27). FSNSP quantifies both the reproductive care practices mothers have obtained and their nutritional status as determined by body mass index (BMI).[9]

Adequate antenatal care (ANC): FSNSP asked mothers about the number of ANC visits received and who provided this care. FSNSP categorizes a woman as having adequate antenatal care who had at least four ANC check-ups with a medically trained provider (28).[10]

Supplementation during pregnancy: A mother who reported taking iron and folic acid (IFA) tablets at least weekly during her pregnancy was categorized as having received supplementation.

Maternal dietary diversity: Data collectors ask mothers to recall all the foods they ate the previous day, which the collectors then categorized into 14 pre-coded food groups. This information was collected and analyzed according to the most recent FANTA-2 guidelines (29).[11]

Maternal chronic energy malnutrition: In line with WHO and DHS standards, an adult woman is categorized as thin or calorie-energy deficient (CED) if her BMI falls below 18.5 (30; 6).

Maternal overweight and obesity: An adult woman is categorized as overweight or obese if her BMI is above 23, a cut-off point that is typically used for Asian populations (31).

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6. HHS is a targeted measure of households with severe food deprivation and not a measure of overall food insecurity.
7. See page 45 of the *HIES report 2005.* Because it is only based on commodities, the calculated price calculated should not be interpreted as a true estimate of the cost of food, but it is expected to tightly co-vary with the daily, per capita cost of food.
8. Because the first year of FSNSP only collected data on mothers of children under the age of five years, this report only provides indicators for maternal health and nutrition and not indicators for all Bangladeshi women.
9. Body Mass Index (BMI) is constructed by dividing weight in kilograms by height in meters squared. Whenever possible all mothers who reported to be pregnant and whose youngest measured child was less than 2 months of age are excluded (30).
10. FSNSP uses the same criteria as Bangladesh's DHS system to define a qualified ANC provider, which includes providers in all the following categories: M.B.B.S. doctors, nurses, medically trained midwives, paramedics, family welfare visitors (FWV), community skilled birth attendants (CSBA), medical assistants (MA), and sub-assistant community medical officer (SACMO) (5).
11. Dietary diversity, when asked about a particular individual, is a proxy measure for both the quantity and quality of food consumed and thereby for nutrient adequacy (29; 55; 56).

Child care and malnutrition

A child's nutritional status is a function of the feeding and food consumption practices in a child's household, the child's pattern of illness and child-care practices. Young children are especially vulnerable to deficits in macro- and micro-nutrients due to their particular nutrient requirements and less developed immune systems, which increase the risk of developing illnesses that will impede nutrient absorption. To assess levels of child malnutrition and its possible causes, FSNSP undertook anthropometric measurements of young children and collected data on feeding and care practices.[12]

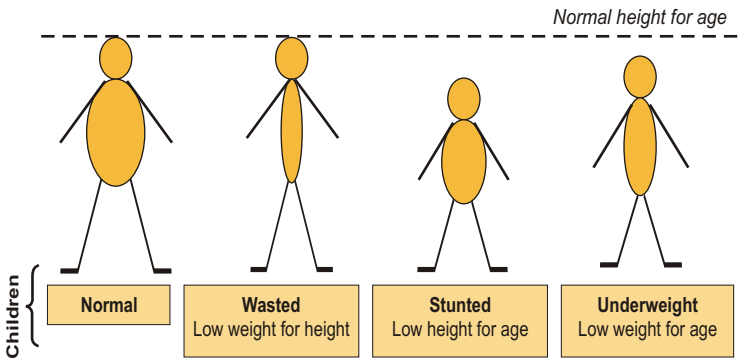
Child feeding indicators: During the first year of the project, FSNSP collected the majority of the standardized infant and young child indicators introduced by the WHO in 2010.[13]

Child morbidity: The caregiver of the youngest child was asked if the child had been ill in the last two weeks (30). The questionnaire specifically probed for cold/cough, fever, diarrhoea, or difficulty breathing. Children with acute respiratory infection (ARI) are those who suffered from both a cold/cough and difficulty breathing (30).

Care for children with diarrhoea: Caregivers of children under-five years of age who had been sick with diarrhoea in the past two weeks were asked about care practices. Children who were offered either the same or more food and given oral rehydration salts (ORS) or increased fluids were classified as receiving proper home care (30).

Chronic child malnutrition (stunting): The most commonly used indicator of chronic child under nutrition, child stunting or low height for age measures the cumulative effects of growth retardation from inadequate nutrition by observing linear growth (Figure 2). Stunting prevalence does not change rapidly and only adjusts slowly after improved dietary intake.

Figure 2: Indicators of childhood malnutrition



Acute child malnutrition (wasting): Acute childhood malnutrition is tracked using three indicators – MUAC z-score, MUAC measurement, and weight-for-height z-score. This report only includes estimates derived from weight-for-height, or wasting, the most accurate measure (Figure 2) (32).

Child underweight: Weight-for-age is a composite measure of children who are malnourished and does not distinguish between children who are stunted or wasted; it may, however, include children who are only mildly malnourished on both of these indicators(Figure 2).

12. The nutritional status of children is assessed with reference to the 2006 World Health Organization's child growth standard. This report will utilize four indicators provided by this reference population: height-for-age, weight-for-height, weight-for-age, and BMI-for-age. All children whose measurements indicate that they are between negative two standard deviations (-2 SD) and negative three standard deviation (-3 SD) from the mean of the reference population are classified as moderately malnourished for any given measure. Children who are below negative three standard deviation (-3 SD) are classified as severely malnourished. Taken together, all children who fall below negative two standard deviations (-2 SD) are classified as globally malnourished (57).
13. Out of the fifteen standard indicators, the three indicators not included in the first year of surveillance are “Minimum meal frequency”, “Minimal acceptable diet”, and “Milk feeding frequency for non-breastfed children” (36; 37).

Childhood obesity: Childhood obesity is ascertained using the BMI-for-age growth standard with a cut-off point of positive two standard deviations from the mean (+2 S.D.).

Surveillance design

The design of the surveillance system was revised considerably during the first year of implementation. Initially, FSNSP was envisioned as a nationally representative system that would track seasonal variation in food security and nutrition indicators by division over three major seasons in Bangladesh: the post-aman harvest period (January-April); the height of the monsoon (May-August); and the post-aus harvest season (September-December). In addition, the system was intended to provide annual static estimates of the food security and nutrition situation in all districts of the country at the end of each year. The full design of this system was implemented during Round 1 of surveillance, covering 61 out of 64 districts.[14]

Prior to Round 2, FSNSP conducted a sustainability review. The results of this assessment indicated that a reduction in sample size would reduce costs and logistic requirements and increase the probability that the surveillance system would be continued by the Government of Bangladesh (GoB) after European Community (EC) funding had ceased. Subsequently, the system was revised to include only districts in food insecure zones of the country as defined in the Bangladesh Bureau of Statistics (BBS)/World Food Programme (WFP) Food Security Atlas (33).[15] This modification maintained the surveillance system's commitment to identifying households vulnerable to food and nutrition insecurity, which are often clustered in certain geographic areas of Bangladesh. Based on this adjustment, Round 2 covered 35 districts and Round 3 covered 38 districts including Chittagong Hill Tracts (CHT).

This report presents findings from the three rounds of surveillance data collected in 2010. The first round provides nationally and divisionally representative estimates, whereas data from rounds 2 and 3 provide representative estimates for the food insecure zones of the country. Aggregating data from all three rounds allows generation of representative estimates for districts located in food insecure zones.

Sample size estimates

Sample size was calculated to obtain prevalence estimates of indicators of food insecurity and child and maternal malnutrition for each round by sampling domain, which is the area of the country of interest to the surveillance system. As detailed above, the surveillance sampling domain changed over the three rounds of surveillance. In Round 1, there were 64 district domains whose indicators were intended to be estimated over three rounds of data collection and seven divisional domains whose indicators whould be estimated during the individual round. Beginning with Round 2, this was reduced to 38 district domains which were intended to be estimated over three rounds of data collection and six food insecure domains (zones) which were estimated over each round.

Table 1 outlines the assumptions made in calculating sample size based on the estimated prevalence of five key indicators: childhood stunting, wasting and underweight; maternal under-nutrition; and

14. In Round 1 the three districts of the Chittagong Hill Tracts (CHT) Khagrachhari, Rangamati, and Bandarban were excluded because of political instability.

15. Descriptions of these zones are available in the results section of this report on page 38.

household food insecurity. The sample sizes for each round were calculated using the formula for calculating a 95% confidence interval for a single population proportion (given below). A 5% precision was used in the calculation, except the food insecurity indicator where a 10% precision was used. The formula used is as follows (34):

$$n = D \times \left[\frac{{Z_\alpha}^2 \times P \times (1 - P)}{E^2}\right]$$

Where:

n = required minimum sample size per survey round per district,

D = design effect,

Z = the Z-score corresponding to the degree of confidence,

P = the estimated level of an indicator, and

E = the degree of precision required.

Table 1: Estimated sample size

	Estimated prevalence	*Desired precision*	*Desired sample*	*Design effect*	*Sample for single round domains*	*Sample for three round domains*
Children's indicators						
Stunting	45%	5%	384	1.379	530	177
Wasting	15%	5%	196	1.291	253	84
Underweight	40%	5%	369	1.321	487	162
Mother's Indicators						
Maternal BMI <18.5	30%	5%	323	1.569	507	169
Household Indicators						
Food insecurity (HFIAS)	50%	10%	96	4 (est.)	384	128

Prevalence estimates used in calculating the sample size were drawn from the 2008-2009 Bangladesh Household Food Security and Nutrition Assessment (HFSNA) as it provided recent, nationally representative figures from the same season as Round 1 (25). The sample sizes were adjusted for clustering using the design effect of the 2007 Bangladesh Demographic and Health Survey (BDHS) (5). No national estimate for household food insecurity based on coping scales existed at the time of sampling, so the maximum measure of 50% was selected. The design effect was estimated based on existing datasets from HKI programme impact evaluations that assessed food insecurity in Bangladesh (DISHARI and REAL projects).[16]

The largest sample size required by these indicators was the number of children needed to estimate stunting prevalence at the district level. To fulfill this sample size requirement, in each round a minimum of 177 children had to be measured per district. In keeping with these minimum requirements, the final sample size was 180 households in 9 mouzas or wards per district per round.

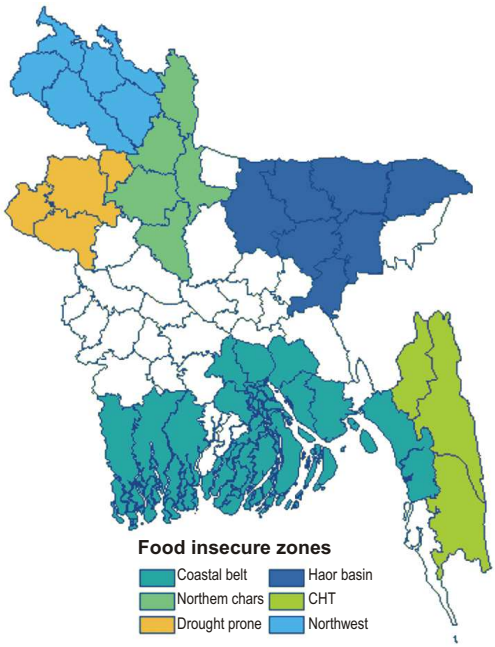
16. These evaluations used the Food Access Survey Tool (FAST)[16] module for assessing food insecurity and not the HFIAS tool that was used in the FSNSP sample size estimation.

Sample selection

The sampling frame for Round 1 was all the districts in the country. However, as noted above, the sampling frame for Rounds 2 and 3 was all districts within the six food insecure zones of Bangladesh as identified by the BBS/WFP *Food Security Atlas* (33). The districts included in each food insecure zone are listed in Table 2 and mapped in Figure 3. The characteristics of each of these zones are presented in the results section.

Surveillance sampling utilized a multi-stage sampling design to reduce travel time and provide a varied sample per district. For each district included in the surveillance system, during each round, three upazilas were selected at random from all upazilas in the district.[17] Subsequently, from each selected upazila, three mouzas/wards were selected at random from all mouzas/wards in the upazila.[18]

Figure 3: Map of the food insecure zones



As a key partner in the project, BBS took responsibility for the selection of upazilas and mouzas/wards. Upazilas and mouzas/wards were chosen with simple random sampling. Although a sample was drawn for the three districts within CHT, in the initial two rounds of surveillance, data were not collected in these areas due to political instability.

During the first year of implementation, FSNSP only sampled households with children under the age of five. In each mouza/ward up to 20 households were selected systematically. The starting point for interviews and assessments for each village was the first eligible house in the northwest corner of the mouza/ward. The next and subsequent interviews were chosen systematically by counting five households from the previously interviewed household and, in a "zigzag" fashion, selecting households from both sides of the road. In situations where the fifth household was not eligible for inclusion, the next household that met the requirements was selected. This process continued until 20 eligible households were identified and interviewed or until the team had used up the time allocated for data collection in that mouza/ward.

A household is defined as a group of related or unrelated individuals that live together and share the same eating and cooking arrangements.[19] Households were considered eligible for surveillance if there was at least one child under five years of age. Both the child and the mother were present at the time of data collection, and the mother consented to the interviews and assessments. Non-response households were substituted with other households in the same mouza.

17. Districts are divided into sub districts called Upazila, the third lowest tier of administrative government.
18. In Bangladesh, the lowest level of administrative government in rural areas is the mauza while it is ward in urban areas.
19. During the first year of FSNSP surveillance there was no differentiation between de jure and de facto populations. Any family member would be considered a member of the household if they lived in the same dwelling, and ate from the communal arrangements if he/she were in the house, and who has spent at least one night in the house in the past four months. For non-family members who live in the house, anyone who stayed in the house more than one month and eats from the communal arrangements is considered a household member. Due to this definition, it is possible that some individuals could be a de jure household member of multiple households.

Table 2: Districts in food insecure zones

Zone	Districts
Chittagong hill tracts	Bandarban, Khagrachari, Rangamati
Coastal belt	Bagerhat, Bhola, Barisal, Barguna, Chandpur, Chittagong, Khulna, Lakshmipur, Madaripur, Noakhali, Satkhira, Shariatpur
Drought prone	Chapai Nawabganj, Joypurhat, Naogaon, Rajshahi
Haor basin	Brahmanbaria, Habiganj, Kishoreganj, Mymensigh, Netrokona, Sunamganj, Sylhet
Northern chars	Bogra, Gaibandha, Kurigram, Jamalpur, Sirajganj
Northwest	Dinajpur, Lalmonirhat, Nilphamari, Panchaghar, Rangpur, Thakurgaon

The system of selecting caregivers, mothers and children in each household for anthropometric measurements and questionnaire administration differed slightly between rounds 1, 2 and 3. In all rounds, one mother with a child under five years of age was randomly selected from each household for measurement and asked to complete the section on maternal dietary consumption. Additionally, the youngest child of each selected mother was chosen in each round to complete the child feeding and morbidity sections of the questionnaire. Between rounds the selection criteria for child anthropometry changed slightly; during rounds 1 and 3 all children of the selected mother were weighed and measured, and in Round 2 only the youngest child of the selected mother was weighed and measured.

Table 3 summarizes the entire sample selection process for each round in the first year of surveillance.

Table 3: Process for sample selection

Unit of Selection	*Process*
Districts	**Round 1:** All except the Chittagong hill tracts **Round 2:** All in food insecure zones excluding the Chittagong hill tracts **Round 3:** All in Food insecure zones
Upazila	**Round 1:** Random draw of 3 upazilas from the district **Rounds 2 & 3:** District headquarters upazila and random draw of 2 other upazilas from the district
Mouza or ward	**Round 1 & 3:** Random draw of 3 mouza/ward from each of the 3 selected upazilas **Round 2:** Random draw of 3 wards from the district headquarters upazila and a random draw of 3 mouza/ward from each of the other 2 upazilas
Household	**All rounds:** Every 5th house, starting with 1st house in the northwest corner of the village, moving in a counter clockwise direction
Mother	**All rounds:** Random selection of 1 mother of an under-five child in the household
Child	**Round 1 & 3:** All children of the selected mother measured and other child sections administered to the youngest child of the selected mother **Round 2:** Youngest child of the mother measured and asked about child feeding and morbidity

Questionnaire development

To all extent possible, surveillance questionnaires and protocols employed by FSNSP are based on existing global standards. All instruments are available on the FSNSP website (www.fsnsp.net), and key indicators are presented earlier in this section.

Initial questionnaires and protocols were developed in English and subsequently translated into Bangla. The Bangla version of the questionnaire was pre-tested with project staff and subsequently used in an investigator-training exercise involving 400 households not included in Round 1 surveillance. Following pre-testing, modified questionnaires and protocols were back translated into English and reviewed. The back translation into English of the final questionnaire was completed by a consultant who was not familiar with the previous English version. The final questionnaire (in Bangla) was used in the enumerator-training sessions, during which discussions of each question ensured that any unclear wording was identified and modified.

The questionnaire changed slightly between the three rounds of surveillance as outlined in Table 4. However, before each round of data collection, field testing and back translation were undertaken for any altered sections of the questionnaire. After each field test, field coordinators and supervisors refined the questionnaire and protocol in collaboration with enumerators.

Table 4: Sections of the FSNSP questionnaire

Sections	*Components*
Sample identification	**In all rounds:** The respondent's residence by administrative area and the religious and ethnic identity of the household
Household demography	**In all rounds:** The age, sex, marital status, education level, and occupation of each member of the household and identification of the main earner **Rounds 1 & 2:** Participation in government cash for work and NGO programs **Rounds 2 & 3:** Households currently receiving remittances
Child feeding	In all rounds: Child birth weight and pre-lacteal feeding practices. **Rounds 1 & 2:** 12 IYCF indicators (36; 37) **Round 3:** 14 IYCF indicators (36; 37)
Immunization	**Round 1:** Youngest child immunization **Rounds 2 & 3:** Section removed
Child morbidity	**In all rounds:** Recent illness of the youngest child, sick child care practices, healthcare seeking, child night blindness, received VAC and/or an antihelmintic
Household food security	**In all rounds:** HFIAS, HHS, and selected CSI questions and identification of the household member(s) who undertook coping behavior
Dietary diversity	**In all rounds:** Records maternal dietary diversity yesterday
Reproductive health	**Round 1:** ANC and PNC care **Rounds 2 & 3:** Section removed
Household socio-economic status	**In all rounds:** Asset index, land ownership, source of drinking water, and garden **Round 1:** Composition of house, latrine type **Round 3:** Composition of house, cooking fuel, latrine type
Anthropometry	**In all rounds:** Height, weight, and MUAC of mother and children. **Rounds 1 & 3:** Maternal pregnancy status included **Round 2:** Maternal pregnancy status omitted
Community module	**In all rounds:** Distance to community resources and local cost of food commodities **Round 2:** No additional indicators **Round 3:** Cost of perishable food items

Field work

Twenty-two teams of data collection officers (DCO) collected data. Each team had two female interviewers and one male responsible for assisting with anthropometric measurements. Senior monitoring officers (SMO) supervised the activities of every three-member team. Two field managers provided oversight of the data collection process.

Table 5: Dates of data collection

Round	*Dates*
1	January 21 - April 27
2	June 30 - August 30
3	October 4 - December 20

All rounds of data collection were divided into two phases with a one week break in between. The DCO teams spent four to six weeks at a time in the field. The SMO team visited each DCO team at random at least once a week to check questionnaires and adherence to the questionnaire protocol in the field.

Data were collected through structured interviews using a combination of paper questionnaires and proprietary survey software (Surveymaster v1 & v2, HKI)[20] administered using commercially available personal digital assistants (PDAs) (Hewlett Packard, HP iPAQ 112, USA). The questions were the same on the paper questionnaire and the PDA. The first round of surveillance was conducted exclusively by paper questionnaire, but by Round 3 approximately two-thirds of the data were collected using PDAs. Data collected on PDAs were imported using the Surveymaster software.

Anthropometric measurement

In each selected household, weight of children and mothers was measured to the nearest 0.1 kg using a portable electronic weighing scale (TANITA Corporation Japan, model HD-305). Height of mothers, children older than two years of age and recumbent length of children younger than two years of age were measured to the nearest 0.1 cm using a locally made height and length board. The mid-upper arm circumference (MUAC) of children and mothers was measured to the nearest 0.2 mm using numerical insertion tape produced by Teaching Aides at Low Cost (TALC). All anthropometric measurements were performed according to WHO guidelines as specified in the FANTA anthropometry manual (38).

Enumeration team training

An experienced staff of data collection officers received two weeks of initial training on how to interview, how to use PDAs for questionnaire administration, how to conduct anthropometric measurements and how to maintain anthropometric instruments. Before each surveillance round, a one-week refresher training was conducted to share lessons learned from the field and discuss any changes in the questionnaire. Mid-way though each round of data collection, a one-day refresher training was organized to reinforce skills and knowledge.

Quality control

Data quality is ensured through multiple procedures of review and cross-checking performed at all levels. Senior monitoring officers reviewed all questionnaires on the same day of completion by the DCO. Any errors or inconsistencies identified were corrected in the field. Quality control officers (QCO) revisited a randomly selected sub-sample of interviewed households within 48 hours of the visit by the

20. Surveymaster was custom made for FSNSP by Computer Ease Limited, a consulting firm based in Dhaka, Bangladesh.

DCO team to verify the quality of data collected by DCOs. Beginning with Round 3, the internal FSNSP quality control operations were supplemented by BBS staff performing a post-enumeration check (PEC) using a modified questionnaire.

The quality control data were compared to the surveillance data collected by DCOs before phase one was complete. Any question with a high rate of mismatch was reviewed by the project manager, project coordinator, training officer and field managers to identify reasons for the discrepancy and to implement appropriate solutions such as a session on problematic indicators during the refresher training of field staff.

Consent and ethical clearance

To obtain informed consent, FSNSP field coordinators explained the objectives and procedures of the surveillance system and obtained permission from the leaders of the selected districts, upazillas, and mouza/wards. At the beginning of each interview the data collection officers gave details about the purpose of the surveillance and read a consent statement to all respondents, informing respondents that participation is completely voluntary, and that respondents who grant consent have the right to refuse to answer any questions and to discontinue data collection at any time. Consent for measuring children under five years of age was obtained from their caretaker.

Data management

Data entry or importation was done concurrently with data collection. Data obtained using paper questionnaires were entered on two computers using a data entry programme developed in FoxPro software (v2.6) while PDA data were imported using Surveymaster. Two senior data management officers supervised data entry and cleaning, including the transfer from PDA to computers and merging of the data from paper questionnaires and PDA using SPSS (IBM, v16.1).

Data management officers reviewed, edited, and cleaned the data by performing a series of logic, frequency and data range checks. Any inconsistencies identified were checked visually by comparing them to the information on the original questionnaire or to the data collectors' notebooks and necessary corrections were made. The data management officers consulted with field managers and senior monitoring officers to understand any discrepancies during the data cleaning process.

Statistical analysis

Data analysis was done using SPSS (IBM, v16.1) and Stata (StataCorp, v11.0). The data are described using proportions with confidence intervals and means with standard deviations. Estimates were weighted using sampling weights that were constructed based on each household's probability of selection. These weights were constructed using 2001 community series of the Bangladesh census. All analysis and estimations were performed utilizing the *svy* commands in Stata, taking into account the complex sampling design.

Limitations

The re-establishment of a national food security and nutritional surveillance capacity in Bangladesh over the last 2 years has involved numerous scientific and administrative challenges and decision points. Indeed, the three rounds of data collection, entry, and synthesis completed during the first year of surveillance have been critical in helping refine and strengthen the system.

One major challenge confronting the FSNSP technical advisory team providing guidance to the new surveillance system related to sampling. Round 1 employed a nationally representative sampling frame

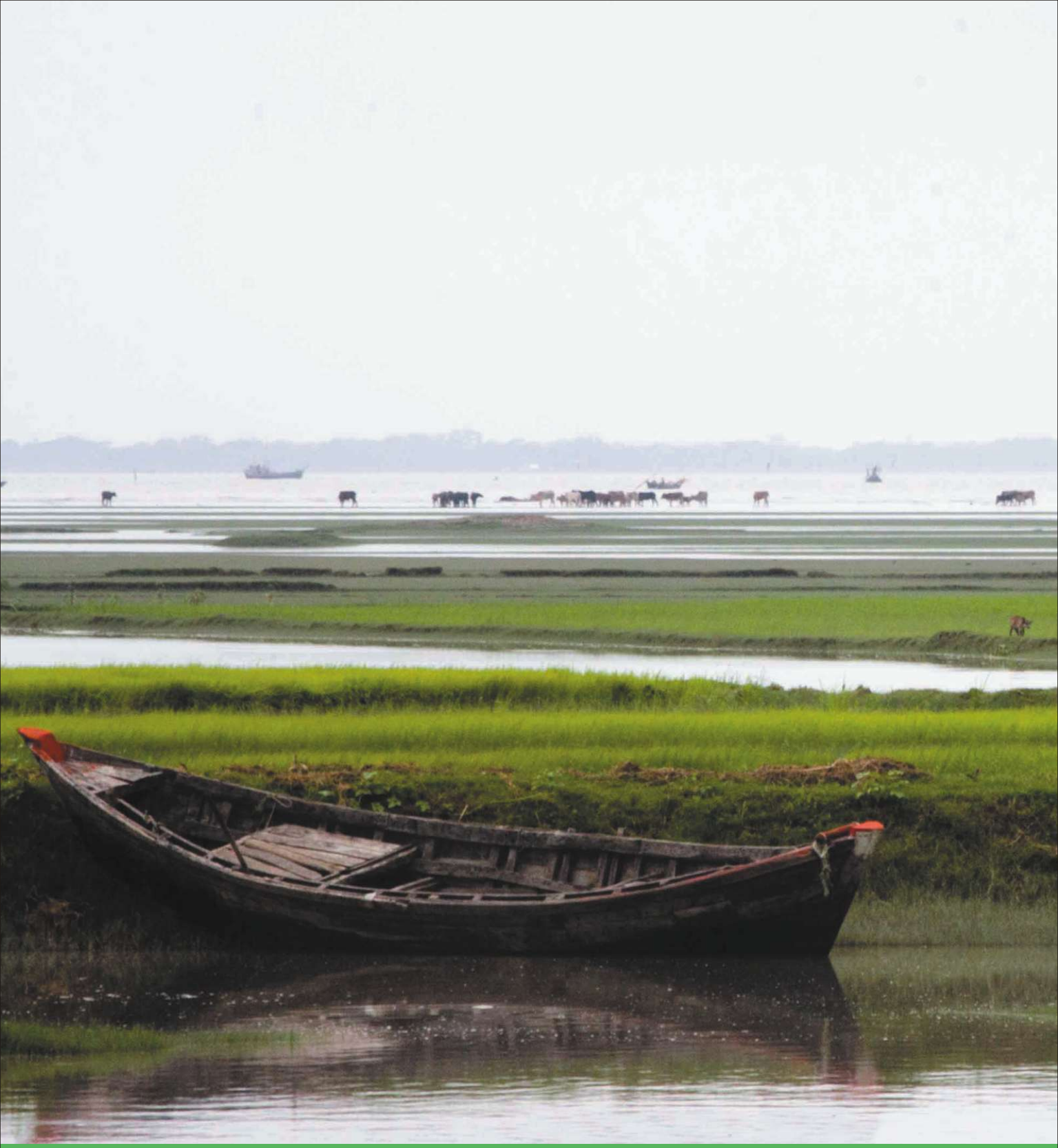
based on district administrative units. In Rounds 2 and 3 a decision was taken to focus more narrowly on food insecure zones. The benefits of this more focused sampling frame relate to higher resolution information in areas at greatest risk to food insecurity and malnutrition as well as reduced overall costs of surveillance. The downside relates to the inability to make nationally representative assessments with a more focused sample in Rounds 2 and 3.

The first year of surveillance also focused on households with children under 5 years of age. This decision increased the system's resolution with regards to child and reproductive outcomes but it also worked to exclude women pregnant for the first time and reduced our ability to generalize household level results to the entire Bangladeshi population. In the second year of FSNSP, the sampling frame has been adjusted to enable larger samples to be drawn from vulnerable regions of the country based on agro-ecological zones and to provide national estimates after each round of data collection. All households with an ever married woman are now included in the household selection process.

Other limitations stem from the difficulty of ensuring that all intended surveillance sites are included even in face of unanticipated logistical or political circumstances. The three districts of the Chittagong hill tracks were intended to be included in every round of surveillance, however political instability precluded their inclusion in all but the last round of 2010.[21] While response for the surveillance system has been very high over all, data collection staff has faced high refusal rates in wealthier urban areas and in a few isolated rural communities. FSNSP has strengthened its links to the local BBS data collection administration to ensure that the purpose of the project is understood by local communities and that data collection staff are promptly notified if political considerations require data collection to be suspended in an area.

FSNSP is designed to provide timely updates on indicators that change rapidly in Bangladesh and a limited number of covariates. However, in an effort to provide a comprehensive system, FSNSP initially included indicators which would not change rapidly and were available from other data collection sources. These indicators have been removed in subsequent rounds of data collection. In addition, use of FSNSP data for reporting and consultation purposes has resulted in the inclusion of several additional indicators in the second year of data collection that were not available from first year data. These changes have improved the FSNSP system overall but they have also occasionally limited the comparability of indicators over rounds.

21. As such, the “national” estimates in this report should be interpreted as “National estimates for Bangladesh excluding the CHT.” This exclusion should not bias estimates as only one percent of the Bangladeshi population resides in the CHT (59).



Background characteristics

National sample

Round 1 was implemented in 549 communities; 143 of these were in urban areas. The mean size of households was much larger (5.3 members) than the size of the households in Bangladesh as a whole,[22] because FSNSP's sampling frame excluded households that did not contain a child under five years of age. The largest mean household sizes were reported in Chittagong and Sylhet (6.1 and 6.2, respectively) while the smallest households were found in Rajshahi, Khulna, and Dhaka (4.9, 5.0, and 5.2, respectively).[23]

Table 6: Household size

	Mean Household size	n
Division		
Barisal	5.6 *(5.4 - 5.7)*	1,080
Chittagong	6.0 *(5.6 - 6.4)*	1,440
Dhaka	5.2 *(5.0 - 5.4)*	3,060
Khulna	5.0 *(4.9 - 5.1)*	1,800
Rajshahi	4.9 *(4.7 - 4.9)*	1,440
Rangpur	*4.7* *(4.5 - 4.9)*	1,440
Sylhet	6.2 *(5.8 - 6.6)*	720
Total	5.3 *(5.2 - 5.4)*	10,980

The occupational pattern of households differs greatly by division. Figure 4 disaggregates the primary income source of each household. While households throughout Bangladesh earn income though business, households predominantly dependent on business income are relatively more common in Chittagong, Barisal, and Sylhet. Rangpur division has the highest proportion of households earning income primarily through unskilled labour and the lowest proportion who earn income through business or salaried employment. Dhaka has a comparatively large proportion of households receiving salaried incomes. Fishing is a highly regional occupation, with only a minority of households earning income through this means in Sylhet and Barisal.

Maternal education

The level of maternal education is both indicative of overall education levels in an area and an important protective factor against childhood malnutrition and illness. Maternal education in Bangladesh is low overall but varies greatly from division to division. Nationally, only 60% of mothers have completed at least five years of education and 24% of mothers have not completed even one year of schooling. The lowest level of maternal education is in Sylhet, where 40% of mothers have no education and only 47% have completed at least primary school. By contrast, the highest rate of education is in Khulna, where 69% have completed primary school and only 13% of mothers have no education.

22. Recent figures include 4.7 members in the 2007 BDHS (5) and 4.9 in the 2001 census (59).
23. In the 2001 census, the same pattern of household size by division is observed (Rajshahi 4.6, Khulna 4.7, Dhaka 4.8, Barisal 5.0, Chittagong 5.4, and Sylhet 5.7) (59).

Figure 4 : Proportion of households by primary occupation of main income earner

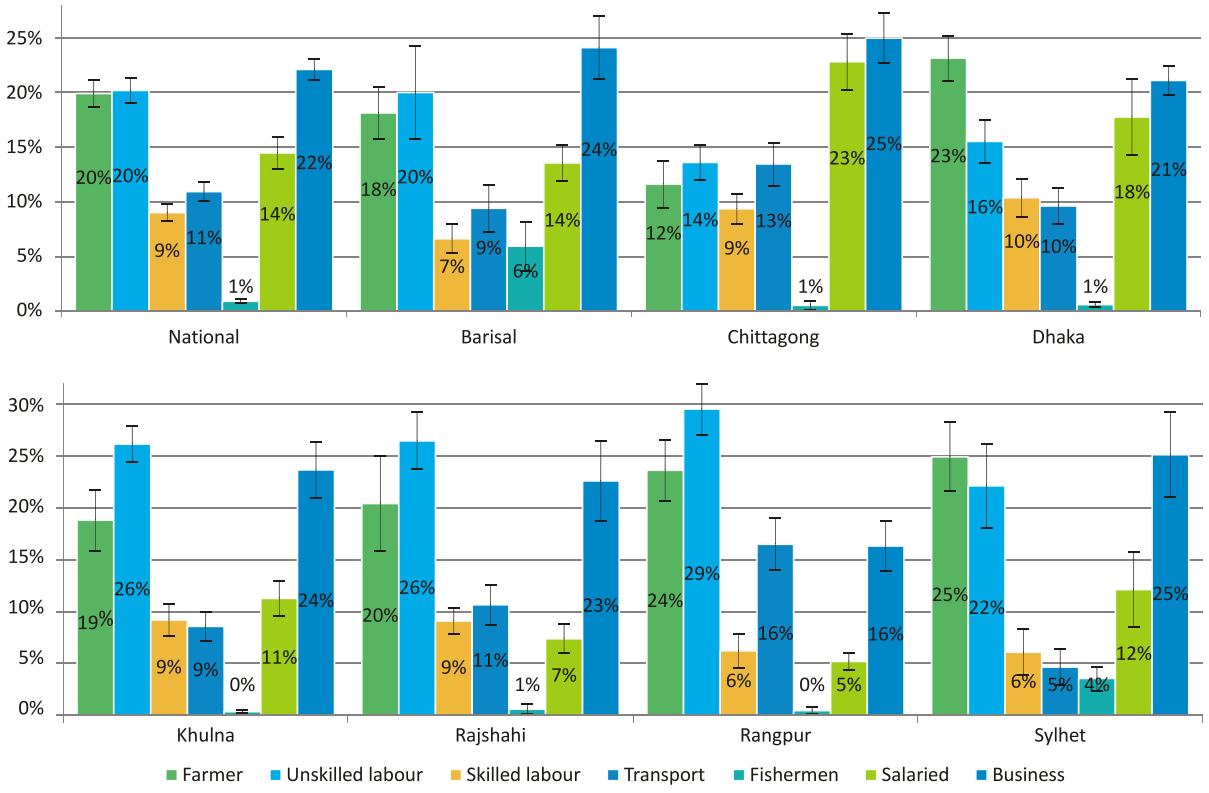
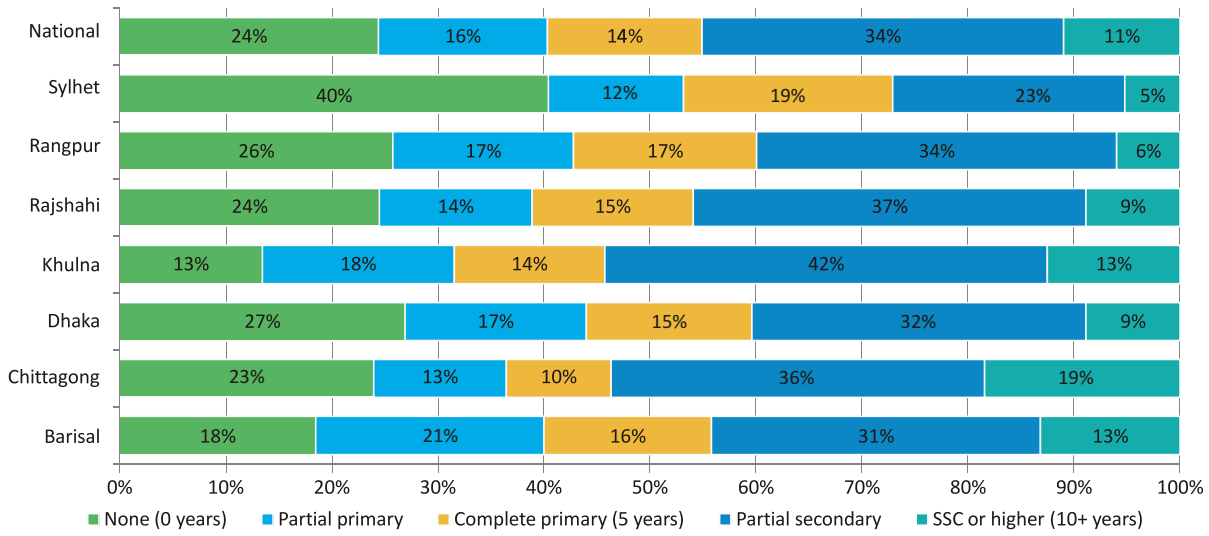


Figure 5 : Educational attainment of mothers by division

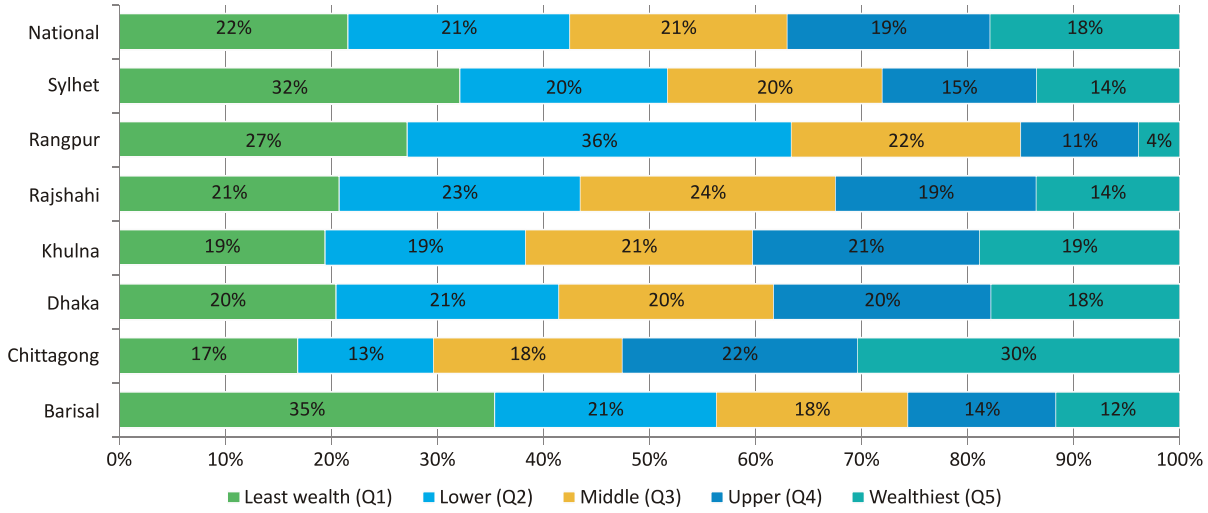


Household wealth

Round 1 recorded information on the quality of household structures, water and sanitation systems, and asset ownership. These household characteristics are typically linked to overall health and nutritional outcomes and the ability to weather periods of crises. Results indicate that only 55% of households possess an electricity connection or solar generator despite electricity being available in 79% of communities. Houses are largely constructed of bamboo, wood, or tin walls (24%), tin roofs (90%), and mud floors (78%). A small minority of households (1%) report using unsafe surface water for drinking while only 7% of households have access to piped water. A sizable percentage of the population still possess rudimentary sanitation facilities: 8% of households use a hanging toilet or no facility and 6% of households use an open pit toilet.

The proportion of households falling into each wealth quintile is found in Figure 6. Chittagong division has both the lowest proportion of households in the poorest wealth quintile (15%) and the highest proportion in the wealthiest quintile (33%). By contrast, 32% of the households in Barisal fall into the poorest wealth quintile while only 12% are in the wealthiest.

Figure 6 : Proportion of households in each wealth quintile



Characteristics of food insecure zones

During all three surveillance rounds data were gathered from five of the six food insecure zones listed in the BBS/WFP *Food Security Atlas* (33).[24] These data provide a means of assessing seasonal variation in nutrition and food security; however, because this is the first year of surveillance, it is unclear whether observed variations are indicative of typical seasonal trends. Nevertheless, analysis of the relationships between demographic characteristics, geographic zone, and season yield helpful insights regarding who should be targeted for what type of intervention at what time of year.

The food insecure zones described in the *Food Security Atlas* have the following characteristics (33):

24. Due to political instability during the first round, surveillance was not undertaken in the Chittagong Hill Tracts – one of the six food insecure zones identified in the BBS/WFP Food Security Atlas (33) – until round 3.

Coastal belt

The Coastal belt is a complex delta formed by multiple river systems including the Ganges, Brahmaputra and Meghna. The area is characterized by a constantly changing geographic and geomorphologic situation with high risks for natural and manmade disasters. The coastal area covers about 20% of the country and over 30% of the nation's net cultivable area (39). The zone contains three distinct geographies: the southwest region near Sundarban mangrove forest; the active delta area of the central south region; and the southeast estuary and hilly areas region. The western and central regions are flat and low (40). The region includes both small and large islands as well as char lands (33).

Drought prone

The Drought prone zone is concentrated in the western-most parts of Nawabjanj, Rajshahi and Noagaon districts, just north of the Padma River. This area of Bangladesh receives less rain than the rest of the nation and is thereby prone to drought. A combination of high temperature, low annual rainfall and soil moisture deficiencies have a devastating impact on agricultural production and threaten both small-scale farmers and labourers. Agricultural irrigation in this area has been made more difficult because of the damming of the Padma river in India. Residents of this region of the country are limited to one crop of rice a year. Landownership in this area is less equally distributed than in other areas of Bangladesh.

Haor basin

In Bangladesh's north-east, the Haor basin is a saucer-shaped, shallow depression (backswamp) that is underwater for nearly half the year. Settlements are scattered and clustered on small patches of raised land. Roads are few and many are submerged during the rainy season, resulting in villages seasonally accessible only by boat. Residents have limited access to schools, health facilities and markets. Many households depend on sharecropping and pay much of their income in rent. During the rainy season, many men migrate to work as labourers in areas with aus rice harvests; those who remain often work as day labourers for the larger fishing industries. Flash floods at the end of the dry season can damage the sole rice crop and severe storms can affect crop production and destroy marginal housing.

Northern chars

The Northern chars are unstable lands concentrated around the Brahmaputra and Jamuna rivers that are characterized by high levels of flooding, erosion and instability. Inhabitants are particularly vulnerable as the erosion of the land forces them to move regularly. There is limited access to infrastructure and services and communication and transportation systems are poor. There are few roads through this area; river transport is primarily used, particularly during the rainy season (33). The soil is extremely sandy and generally poor for cultivation.

Northwest

The Northwest region is a slightly sloped plain in the northern part of the Rangpur division at the foot of the Himalayas. It is a food surplus production area with excellent soil fertility, and agriculture is the principal source of employment. However, natural disasters such as seasonal floods, cold and droughts frequently destroy crops, livelihoods and homes (33). Most of the agricultural land is used to grow rice, mainly aman crop of rice harvested predominantly from early November to mid-December and secondarily boro crop of rice harvested from mid-April to the end of May (41). Landownership in the Northwest is less equally distributed than in other areas of Bangladesh.

Household characteristics by zone

Occupation patterns differ by food insecure zone (Figure 7). The Coastal belt has a lower proportion of households that depend primarily on farmers and unskilled labourers than other zones and a greater proportion of households relying on salaried employees. In contrast, the Drought prone, Northern chars, and Northwest zones all have high proportions of households depending on income from farmers and more depending on income from unskilled labourers. As expected, the Hoar basin and the Coastal belt zones have the highest proportion of households that rely on income from fishing.

Distinct seasonal patterns are also apparent (Figure 8). A greater proportion of households rely on income from unskilled day labour and fishing during the monsoon months of June – August, whereas the proportion of households reliant on income from business shows little seasonal variation. Interestingly, the proportion of households reporting a salaried wage earner rose dramatically between the second and third surveillance rounds. This change is likely related to the Eid holidays, when many expatriate workers return home, and larger numbers of households included in the surveillance system reported receiving remittance income.

Figure 7: Occupational groups by food insecure zone

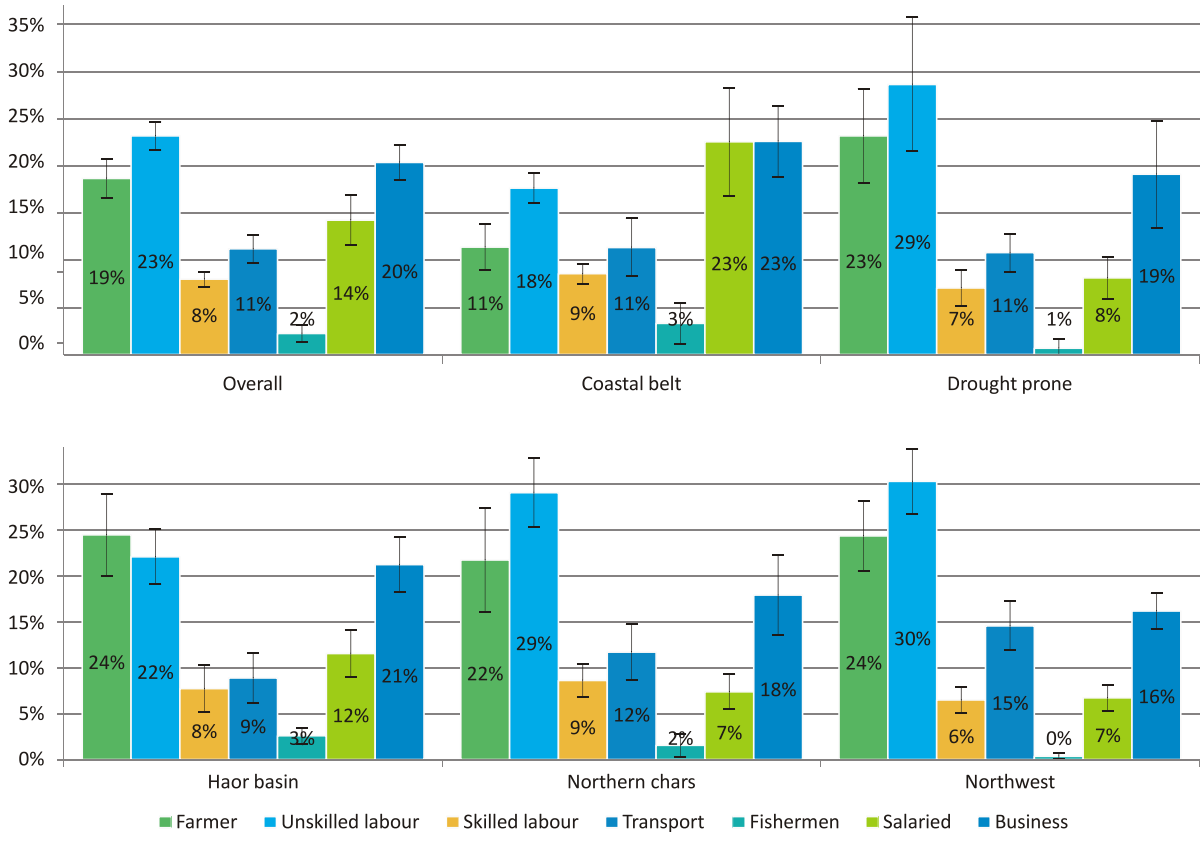
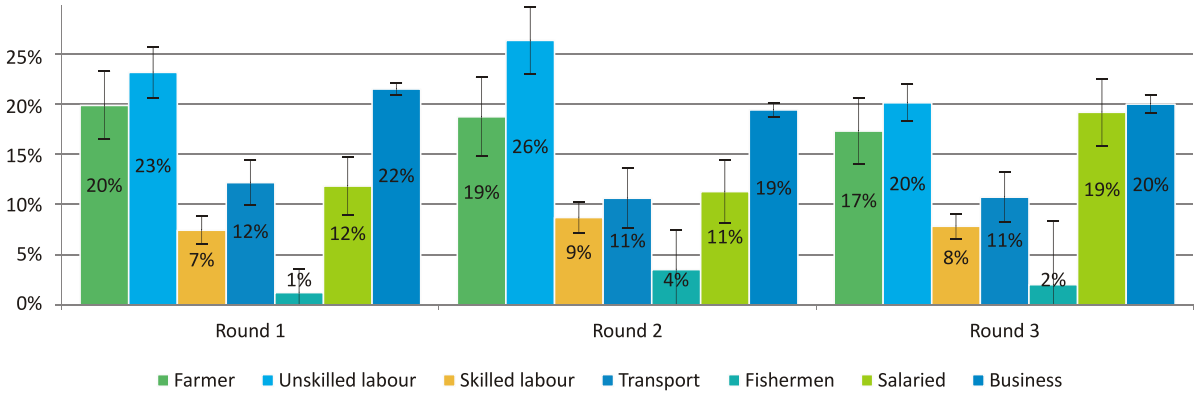


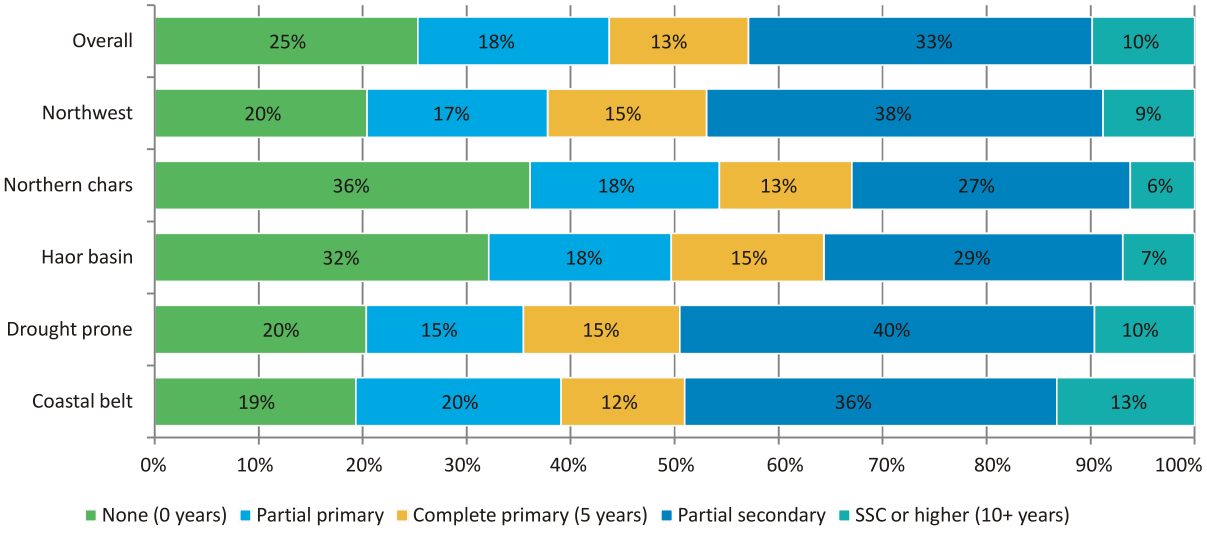
Figure 8 : Occupational groups by season



Maternal education

Levels of maternal education also vary greatly by zone (Figure 9). In general, none of the food insecure zones report high rates of maternal education - the class completion rates falling below the national figures estimated from the first round of surveillance (primary school completion 60% vs. 56% and secondary school completion 11% vs. 10%, respectively). Maternal education rates are lowest in the Northern chars and Haor basin zones, where more than 30% of mothers have not completed one year of education and less than half have completed primary school.

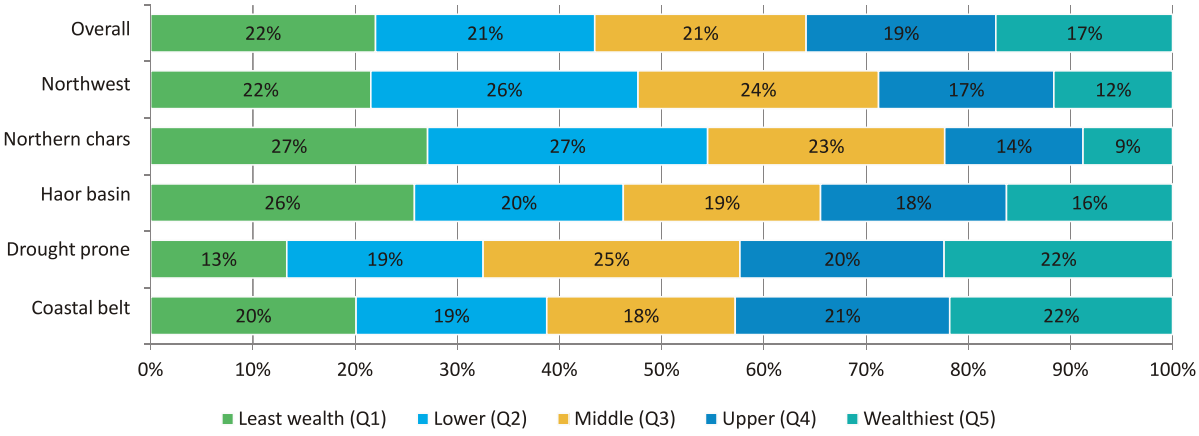
Figure 9: Educational attainment of mothers by food insecure zone



Household wealth

Figure 10 displays the proportion of households in various zones that fall into each of the five wealth quintiles. The Northwest and the Northern Char zones have a lower proportion of households in the top two wealth quintiles compared to the other three zones. Only the Drought prone zone has a much lower proportion of households in the lowest wealth quintile.

Figure 10: Proportion of households in each wealth quintile by food insecure zone



Food insecurity

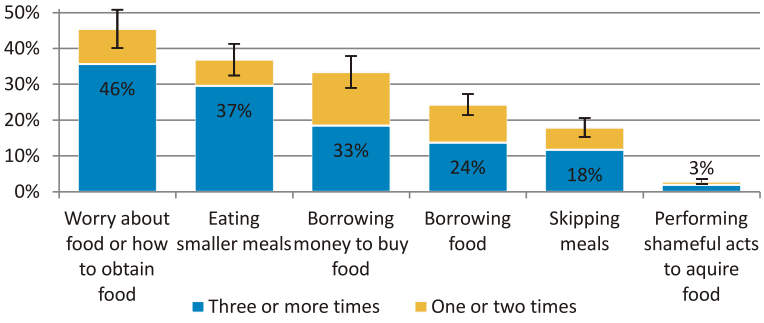
National analysis

FSNSP is the first-ever surveillance system in Bangladesh to provide routine, national-level estimates of food insecurity based on HFIAS or HHS. Before FSNSP, the only previous national survey that assessed the food insecurity status of Bangladesh was the HFSNA (25). [25]

According to FSNSP's surveillance data, national levels of household food insecurity are shockingly high in 2010. Overall, FSNSP identified 44.5% of households with children under the age of five (45%) as food insecure and 16% of such households suffered hunger in the past month as measured by HHS.[26] This result is even more concerning given that the first round of FSNSP was administered during and shortly after the largest rice harvest of the year (Aman).

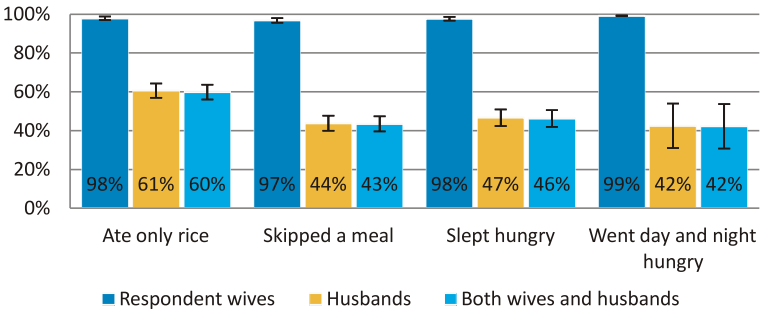
As shown in Figure 11, food insecure households exhibit a range of coping techniques, the most prevalent of which is worrying about food or how to obtain food, closely followed by eating smaller meals and borrowing money in order to purchase food. Less than a quarter of households reported having borrowed food directly from neighbours or skipped entire meals, and only a few resorted to acts viewed as shameful, such as begging or scavenging, in order to acquire food.

Figure 11: Proportion of households practicing coping behaviours



The frequency of most of these behaviours resembles those reported in the 2009 HFSNA survey with the exception of "borrowing food from friends and neighbours", mentioned by far fewer respondents during Round 1 than during the HFSNA survey (24% vs 53%, respectively). This difference could be a function of the unique factors occurring during the year of data collection or the fact that HFSNA included all households while FSNSP only sampled households with children less than five years of age.

Figure 12: Husbands and wives: Who employs coping mechanisms?



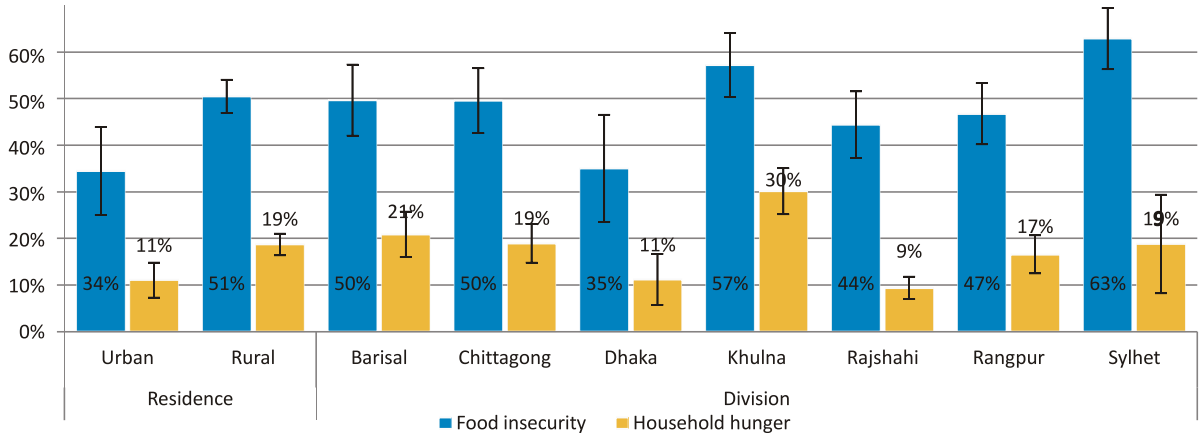
25. This assessment sampled from households with and without children and used WFP's Food Consumption Score (FCS) tool to estimate food insecurity. While FCS is a valuable tool for analyzing household's food consumption patterns, it does not capture differences in dietary preferences or worry about food. FCS may understate the prevalence of food insecurity in a country (56).
26. These estimates are almost double those of HFSNA (25%) (25). However, since different measurement tools were used, no conclusion can be made about changes in food security between the two years.

Among households reporting use of a coping behaviour such as giving up a meal or reducing portion size, respondents were asked who in the household practiced that behaviour the last time it was required. Almost universally, mothers reported sacrificing their food intake. When they reported their husbands cutting consumption it was only in addition to and not instead of their own (Figure 12). This pattern of sacrifice was even true for the subset of women who were currently breastfeeding.

Food insecurity by background characteristics

As shown in Figure 13, considerable variation in the proportion of food secure households is apparent across urban/rural residence and by division. Not surprisingly, a lower proportion of households in urban areas are food insecure compared to rural areas. The severity of food insecurity, as measured by the ratio of food insecurity to household hunger, is also higher in rural areas with a greater proportion of food insecure households reporting hunger in rural (37%) vs. urban areas (23%). Divisionally, Dhaka is by far the most food secure and Sylhet and Khulna the least food secure. Household hunger is also much higher in Khulna than in any other division; over half of the food insecure households in Khulna exhibited signs of household hunger.

Figure 13: Proportion of households that are food insecure and hungry by residence



At the national level, an estimated 7,305,000 million children live in food insecure households, while 2,610,000 of these live in households in which household members currently resort to extreme coping techniques such as skipping meals.[27] Due to population density, the greatest number of children in food insecure households are located in Chittagong and Dhaka divisions.

As expected, wealthier households are less food secure and less hungry than poorer households. Figure 14 reveals how only 13% of households in the wealthiest quintile are food insecure in the past month, compared to 80% of households in the poorest quintile. In addition, the severity of food insecurity decreases as wealth increases. Among food insecure households, 44% experienced hunger in the lowest wealth quintile compared to 22% in the wealthiest group. A similar relationship is apparent between food insecurity and mother's education. With increasing education, the prevalence of food insecurity progressively decreases (Figure 14).

27. This was calculated using population figures for children zero to four years of age as given in the 2001 census as for each district.

Figure 14: Household food insecurity and hunger by wealth quintile and maternal education

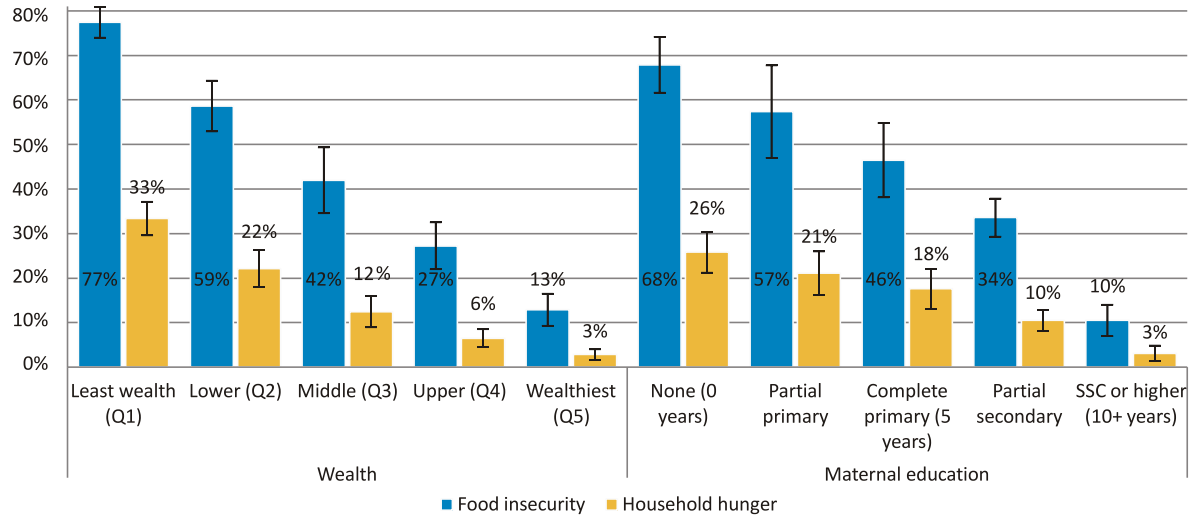
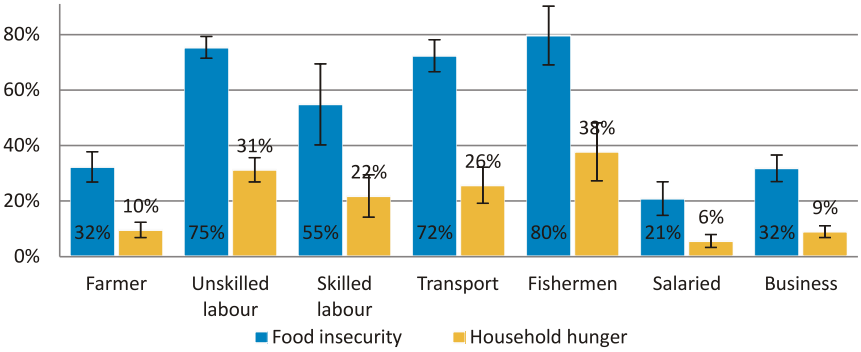


Figure 15: Household food insecurity and hunger by occupational group

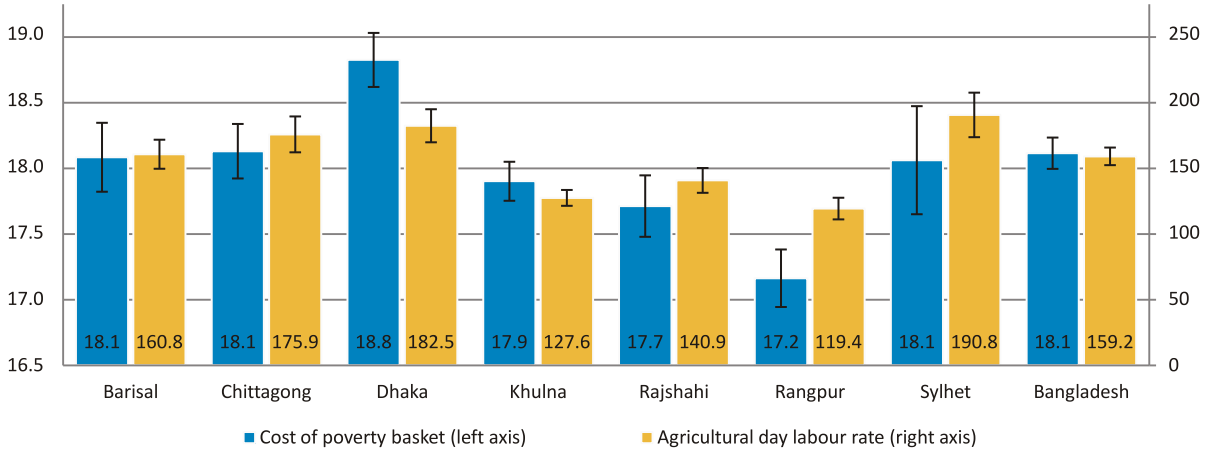


As shown in Figure 15, there is a clear association between the occupational group of the main earner in the household and household food insecurity. Households with a salaried, main income earner are the most food secure and least hungry of any occupational group. Households that primarily make their living from farming their own land, and households engaged in business, exhibit similar low rates of food insecurity relative to other occupation groups. By contrast, households that primarily earn income through unskilled day labour, transport such as rickshaw and CNG driving and fishing are the most food insecure. Fishermen, in particular, fare badly.

Divisional variation in food prices and wages

Unless a household produces its own food, its ability to access food is largely a function of available income and local food prices. FSNSP provides community level information on the cost of food and unskilled labour rates. Figure 16 plots the average values of these two figures by division and for the nation. The cost of the average food basket and wage rates vary widely by division. Dhaka's food basket is by far the most expensive, whereas Rangpur, Rajshahi and Khulna have the least expensive food baskets. Khulna, Rangpur and Rajshahi also stand out as having the lowest agricultural daily wage rates; Sylhet's, Dhaka's and Chittagong's mean wage rates are among the highest.

Figure 16: Divisional variation in food prices and agricultural wage rate



Seasonal variation in food insecurity

While Round 1 results indicate that food insecurity and household hunger are endemic throughout Bangladesh, seasonal data reveal considerable variation over the year. The period January through April 2010 (Round 1) has significantly lower food insecurity and household hunger than the two subsequent seasons - a pattern that is most marked in rural areas (Figure 17) and the Drought prone and Northwest zones (Figure 18). The Drought prone zone has a much larger increase in the proportion of food insecure households from Round 1 to Round 2 than any other zone. Overall, the significant increase in food insecurity from Round 1 (January-April 2010) to Round 2 (June-August 2010) represents about 2 million more children living in food insecure households and almost 1.5 million more children living in households experiencing severe food shortage.

As expected, seasonal variation in food insecurity and household hunger is most pronounced in households in the lower wealth quintiles and least evident in households in the richest wealth quintile (Figure 19). It is important to note that there is virtually no seasonal variation in household hunger in the richest wealth quintile (Figure 19) in contrast to the other wealth quintiles. A very similar pattern is seen when examining seasonal food insecurity by maternal education: households with mothers at the highest level of education appear less susceptible to seasonal variation in food insecurity and household hunger (Figure 20).

Figure 17: Seasonal variation in household food insecurity and hunger by residence

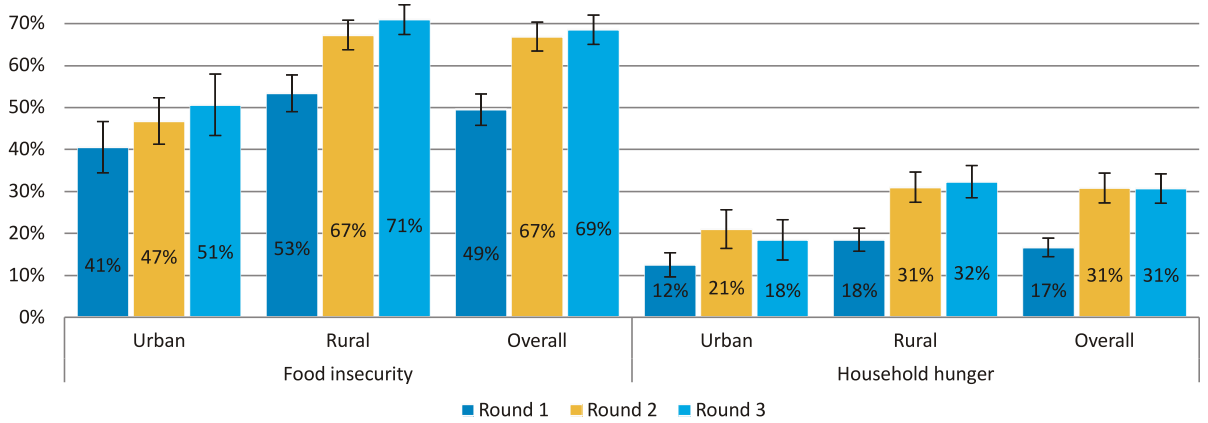


Figure 18: Seasonal variation in household food insecurity and hunger by zone

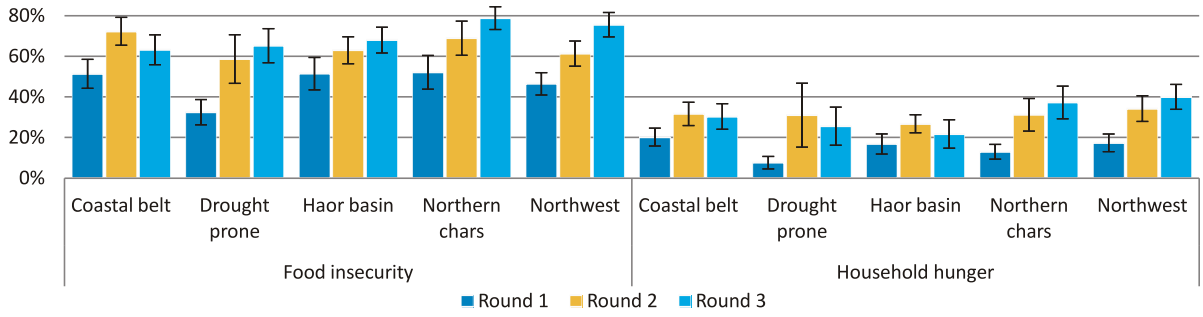


Figure 19: Seasonal variation in household food insecurity and hunger by wealth quintile

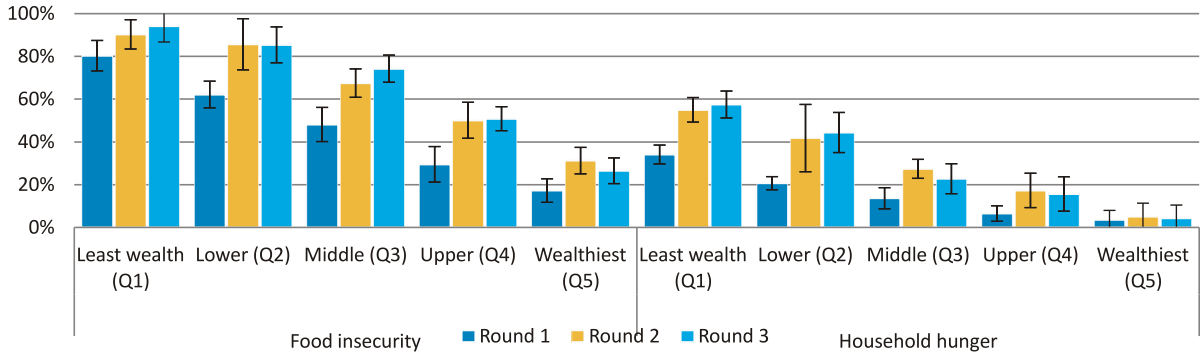


Figure 20: Seasonal variation in household food insecurity by maternal education

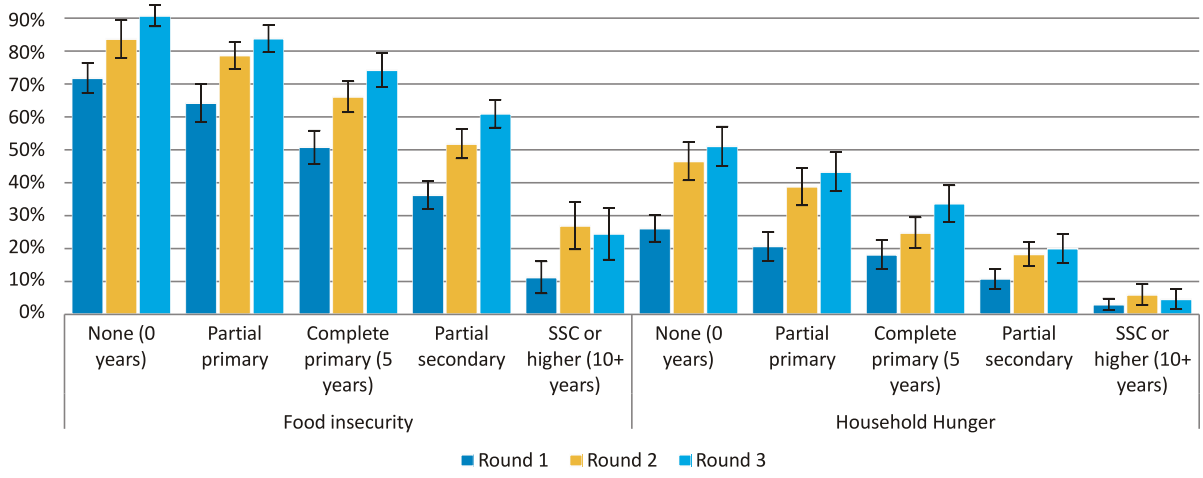


Figure 21 and Figure 22 disaggregate household food insecurity and hunger by the occupational group of the main earner in each household. Overall, the relationships are as expected: those who farm their own land, salaried workers and businessmen are more food secure than daily labourers, fishermen, or those in the transport industry. Food insecure households headed by unskilled labourers and fishermen suffer food shortages in greater proportion than households headed by other occupational groups.

Figure 21: Proportion of households food insecure by occupational group

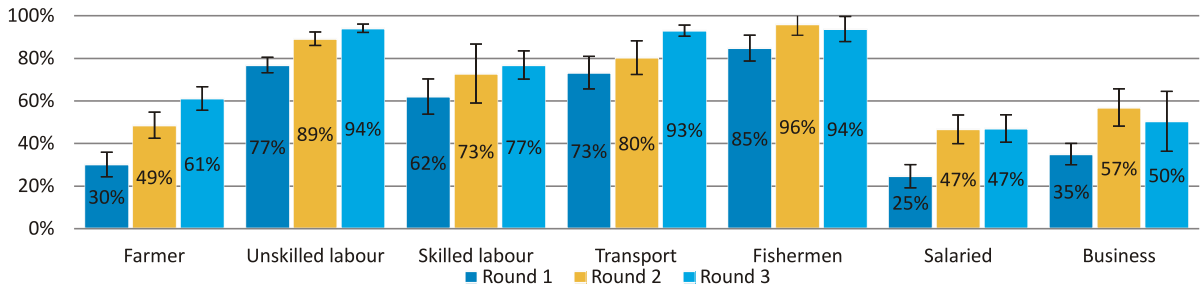
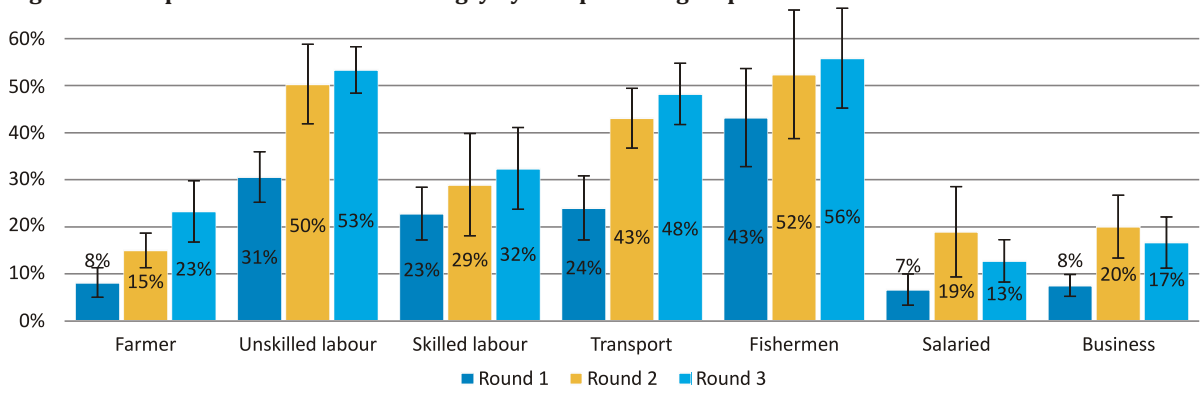


Figure 22: Proportion of households hungry by occupational group



Food prices rose dramatically in the second half of 2010 (42). From Round 1 to Round 3, the average price of the commodity food basket rose 19%. At the same time the mean agricultural wage rate increased only 12% (Figure 23). Figure 24 displays the average commodity food costs and unskilled agricultural wage rates by zone. The price of food rose in all zones, while average wage rates increased considerably in the Northern chars and Northwest zones but only marginally in the other three zones. Across zones, the ratio between the agricultural wage rate and the price of the commodity food basket decreased significantly from 8.2 to 7.7 from Round 2 to Round 3 (Adjusted Wald test, $p<0.014$). The overall increase in food prices relative to wage for the unskilled sector are likely to have contributed to the marked increase in food insecurity across zones.

Figure 23: Seasonal variation in food prices and daily wage

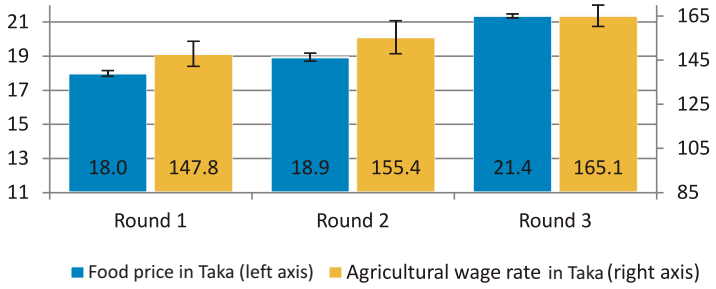
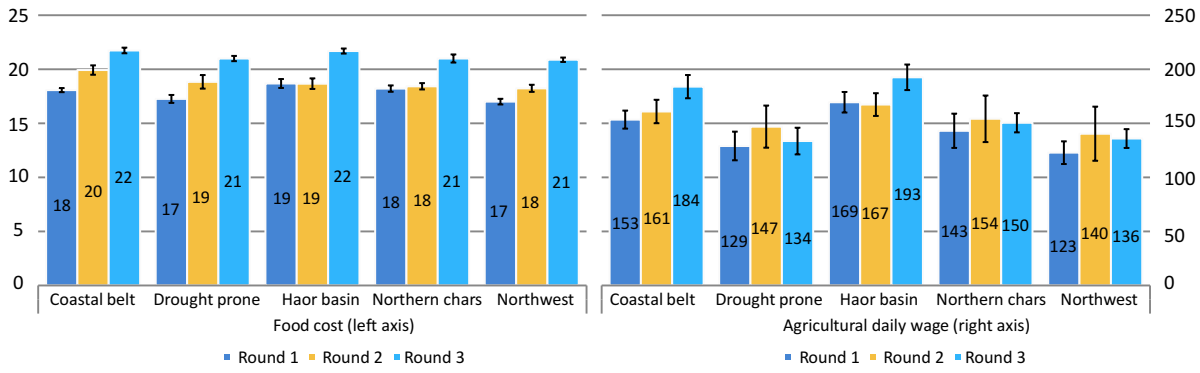


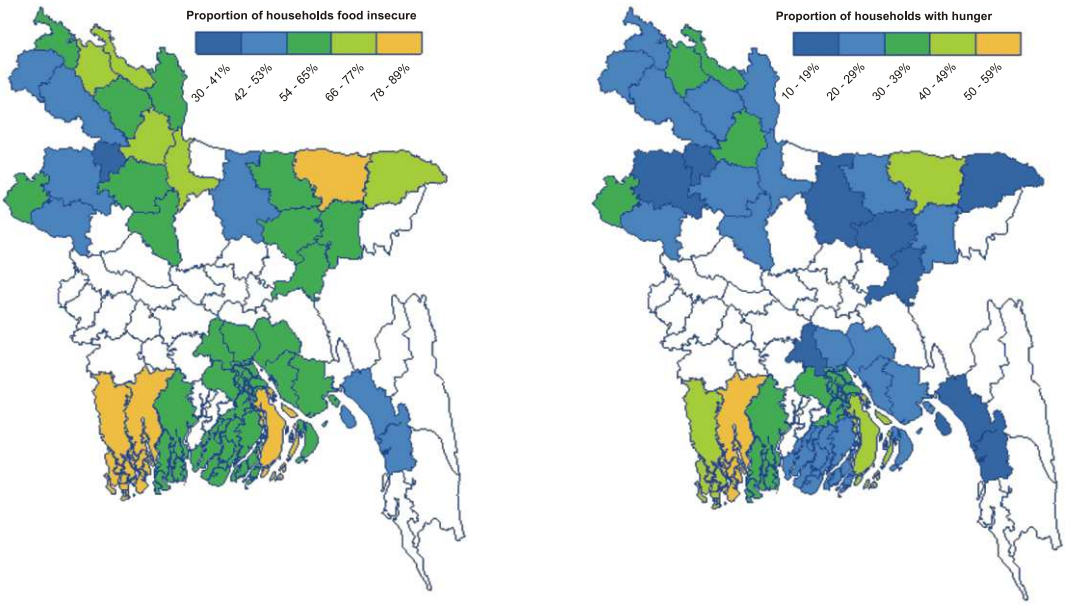
Figure 24: Seasonal variation in food prices and agricultural wage rates by zone



District level variation in food insecurity

As shown in Figure 25, within food insecure zones sizable variations in levels of food insecurity exist between districts. In the Northwest zone, Dinajpur and Thakurgaon have lower average levels of food insecurity than other districts, and Kurigram and Nilphamari have higher levels of food insecurity and household hunger than the other districts. In the Northern chars, Gaibandha and Jamalpur have elevated levels of food insecurity and Gaibandha also has elevated levels of household hunger. In the Drought zone, Joypurhat has the lowest level of food insecurity of any district in Bangladesh and, with Naogaon, it ranks among the lowest in terms of household hunger. In contrast, Chapai Nawabganj has higher prevalence rates of household food insecurity and household hunger than the other districts in this zone. In the Hoar Basin area Sunamganj has greatly elevated levels of both food insecurity and household hunger while Mymensingh has much lower prevalence rates on both indicators. In the Coastal belt, the far western districts of Satkhira and Khulna as well as Bhola report elevated rates of both food insecurity and household hunger.

Figure 25: Annual estimates of households food insecure and hungry by district [28]



28. Tables of precise prevalence estimates of food insecurity by district are available in *State of Nutrition and Food Security in Bangladesh: Summary Statistics.*

Maternal care and malnutrition

National analysis

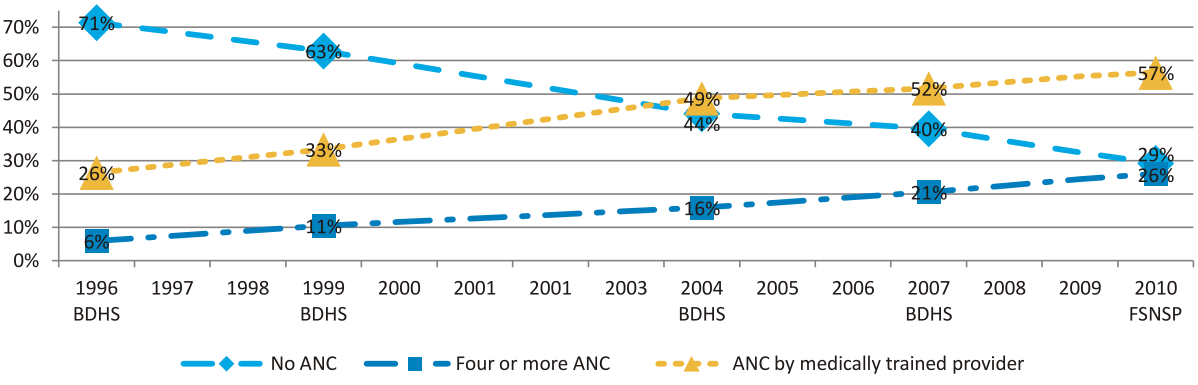
Maternal care and nutrition are vital to ensuring properly nourished and healthy children. Unlike the paucity of data on food security, many studies in Bangladesh measure maternal nutritional status. To provide context, this section will refer to some of these studies when presenting results of indicators for maternal care and nutrition (14; 43; 25; 2; 5; 4; 3). While indicators of antenatal care are only available for the first (national) round of FSNSP, seasonal and district-level data are provided for measures of maternal dietary diversity and maternal malnutrition.

Use of antenatal care (ANC)

Antenatal care (ANC) is the timely and routine care of mothers during pregnancy that maintains the health of the mother and baby through to delivery. Typical components of ANC consist of physical examination, counseling, TT immunization, birth planning, early identification of danger signs of pregnancy and management, and iron and folic-acid supplementation. The Technical Working Group on Antenatal Care recommends that a minimum of four visits by skilled health personnel be completed at specified times during the pregnancy (44).

Figure 26 displays the estimates for selected ANC indicators from Round 1 as well as recent national surveys (3; 2; 5; 4).[29] Since 1996, the proportion of women receiving no ANC check-ups during their pregnancy has been halved, while the proportion of women who have gone to a medically trained provider has more than doubled. Though the proportion of women completing four or more ANC visits during their pregnancy has increased fourfold during the last 13 years, the current figure of 26% remains unacceptably low.

Figure 26: Trends in ANC (1996-2010)

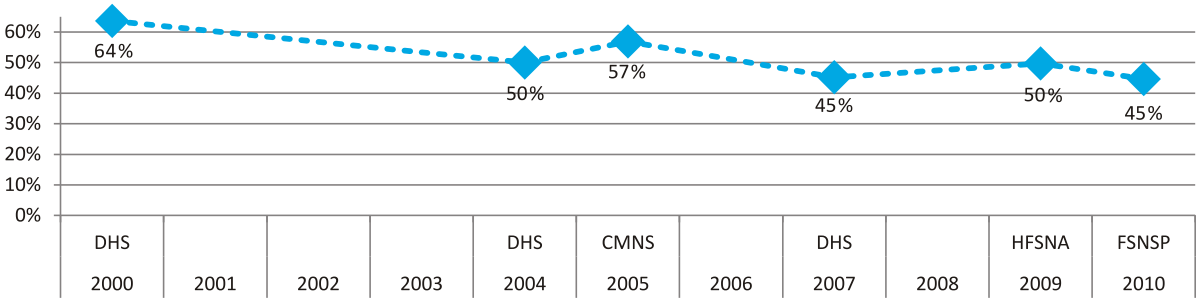


Iron and folic acid (IFA) tablets, an essential part of ANC, protect against child-birth defects and complications during delivery. Figure 27 displays the proportion of women who did not take IFA tablets during their last pregnancy as estimated by several recent surveys (14; 5; 25). In 2010, 45% of mothers

29. All results from these surveys are comparable. The 1993-1994 BDHS and UNICEF's Multi-Indicator cluster Survey (MICS) in 2006 were not included because they used different, shorter, recall periods (45; 1; 43). The Child and Mother Nutrition Survey (CMNS) in 2005 was excluded because it used a different methodology to report the type and frequency of care (14).

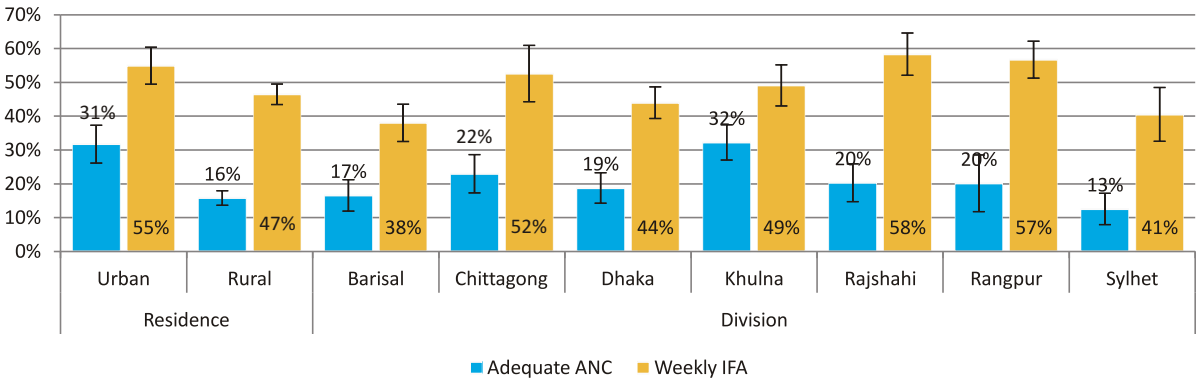
did not take iron tablets even though nearly half of pregnant women in Bangladesh are anemic (8). Although trends indicate that IFA use has increased by nearly one-half over the last decade, current rates of iron supplementation during pregnancy remain unacceptably low.

Figure 27: Proportion of mothers not taking IFA tablets during last pregnancy (2000-2010)



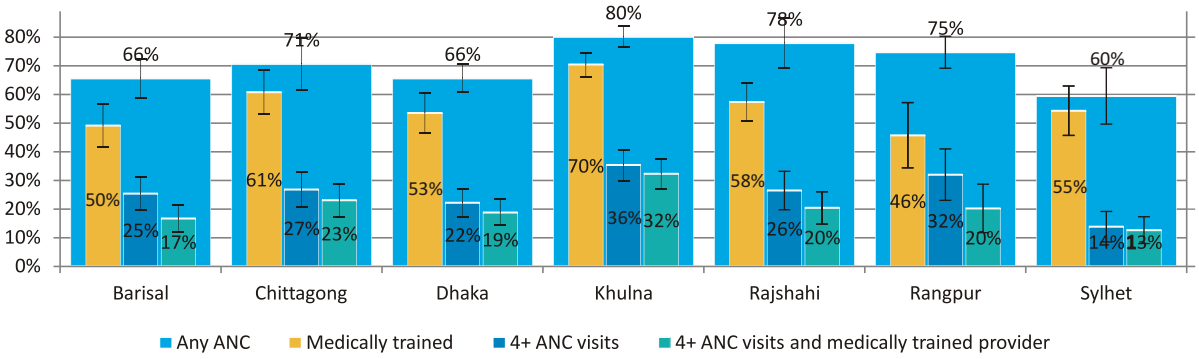
As is seen in Figure 28, a pregnant woman in Bangladesh is more likely to take IFA tablets at least weekly (49%) than she is to obtain a minimum of four antenatal visits, at least one from a medically licensed provider (21%). Remarkable variation in each of these ANC indicators is evident between and within divisions. In Khulna and urban areas, 32% of women received four ANC visits, compared to only 13% in Sylhet, 17% in Barisal and 16% in rural areas. IFA tablet use is comparatively more common in Rajshahi, Rangpur and urban areas, where more than 55% of women received four ANC visits. Again, Sylhet and Barisal rank the lowest, with only 38% and 41% of mothers reporting having received IFA tablets during pregnancy, respectively.

Figure 28: Proportion of mothers with adequate ANC and those who take IFA at least weekly



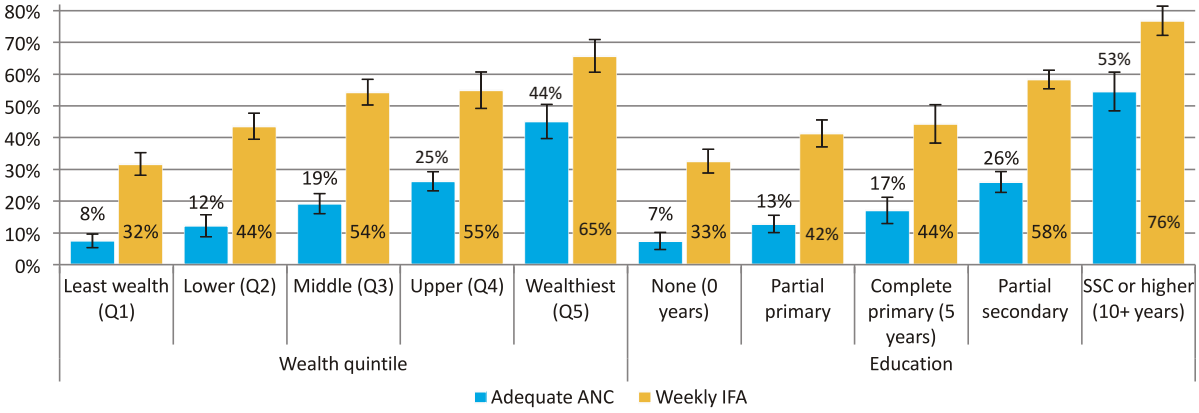
In addition, the gap between these components of ANC is greater in rural areas than in urban areas and greater in the northern divisions of the country -- Rajshahi, Rangpur and Sylhet. This gap suggests that although mothers may be aware of how to protect themselves and encourage healthy fetal development, as indicated by the increasingly widespread use of IFA, mothers lack sufficient capacity or opportunity to ensure that they receive a minimum of four ANC check-ups. Figure 29 explores possible reasons for these gaps in care and displays differences in antenatal care by division. The thick bar indicates the proportion of mothers who received any form of ANC, while the three inner lighter bars show the proportion of mothers receiving each of the following: care from a medically trained provider; four or more ANC check-ups; and four or more ANC visits with at least one from a medically trained provider.

Figure 29: Proportion of mothers with adequate ANC by component



Sylhet is the division with the lowest proportion of mothers receiving any ANC check-up in the last five years, although care is predominantly received from medically trained workers. Rajshahi and Rangpur have the highest proportions of mothers receiving ANC check-ups, but less than 75% are provided by skilled personnel . Relative to other districts, Khulna ranks highest in terms of the proportion of mothers receiving any antenatal care, most of which was obtained from trained providers. These variations are likely due to differences in access to health care in each division, and the availability and acceptability of trained health workers. To ensure mothers obtain adequate ANC across Bangladesh, further research is needed to help tailor interventions to the unique constraints of each area.

Figure 30: ANC components by household wealth quintile and education



As expected, more educated mothers and those living in wealthier households obtain minimum adequate ANC and take IFA at least weekly in greater proportion to less educated and poorer mothers (Figure 30). In addition, poorer mothers are 400% more likely to take weekly IFA than to receive adequate ANC check-ups, while wealthier mothers take weekly IFA only 40% more than they receive adequate ANC check-ups. However, even in the wealthiest quintile, less than half of mothers report receiving adequate ANC in the last five years and only two-thirds report taking IFA at least weekly. Further research is needed to understand the constraints that prevent mothers from accessing ANC, and to establish whether future programming should focus on social constraints to care (raising the acceptability of obtaining ANC) or if health service availability is the real constraint (the lack of qualified human resources and facilities in hard-to-reach areas).

As shown in Figure 31 mothers from households that mainly rely on income from fishing are the least likely to receive adequate ANC, while those from households whose primary source of income is business or salaried work do much better. This difference could be because of the more urbanized nature of salaried work and the greater availability of services or the greater levels of wealth and education associated with these occupations.

Figure 31: ANC components by occupational group

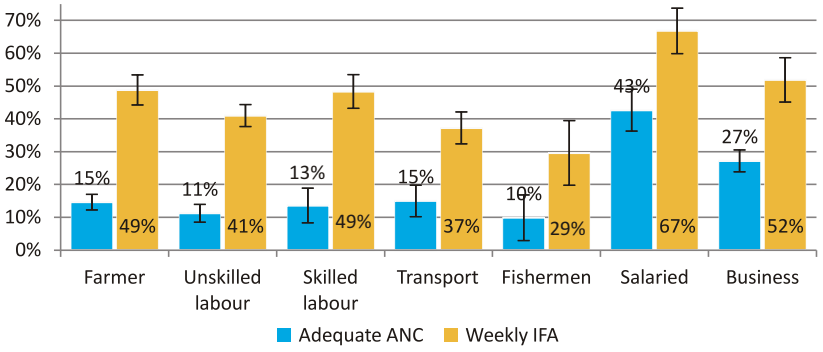
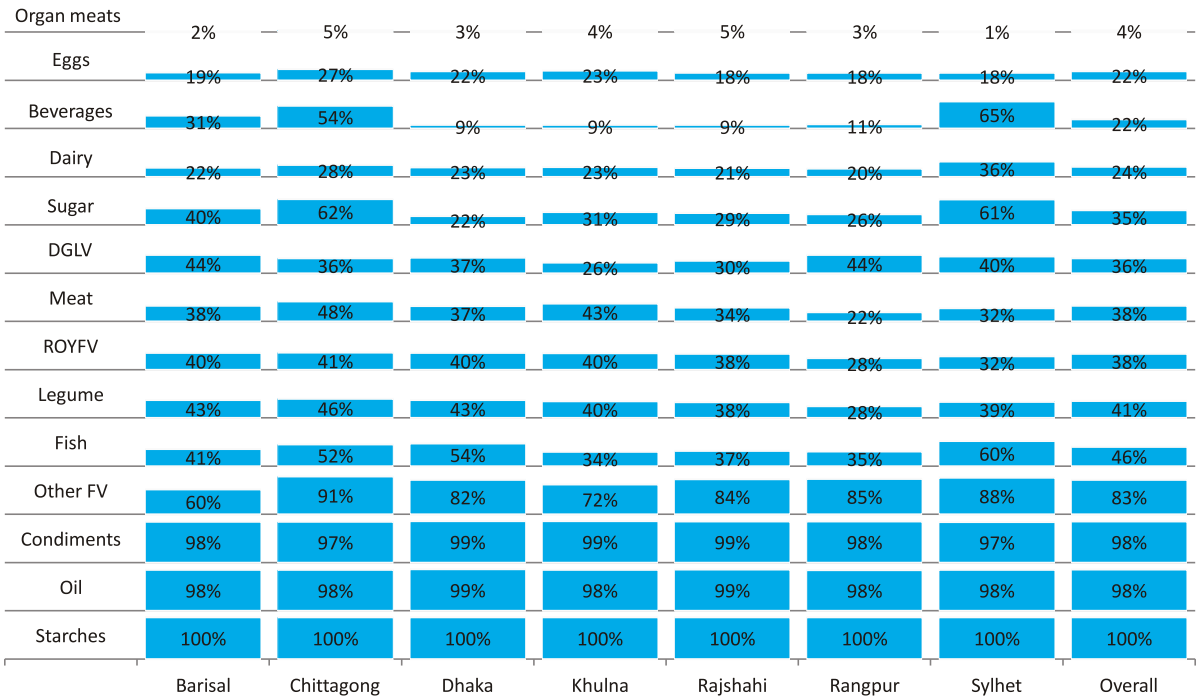


Figure 32: Proportion of mothers consuming different food groups by division[30]



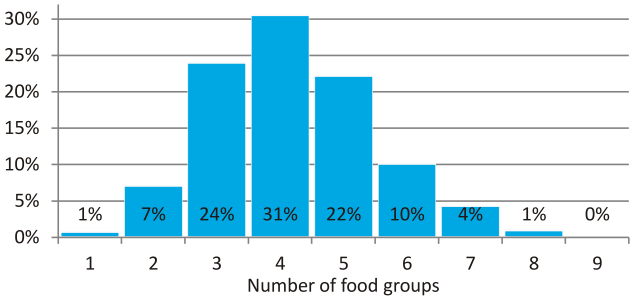
Dietary patterns of mothers

While typical rural diets in Bangladesh lack diversity, sizable differences in consumption patterns exist across divisions (Figure 32). Fewer mothers in Barisal and Khulna consume fruits and vegetables (60% and 72%, respectively) than mothers in other divisions (83% overall). As might be expected, the eastern part of the country reports higher levels of fish consumption while the tea-producing areas of

30. In the interest of space, this graph uses the following acronyms: DGLV meaning dark green, leafy vegetables; ROYFV indicating red, orange, or yellow fruits and vegetables; and Other FV denoting other fruits and vegetables.

Chittagong and Sylhet report higher levels of tea and soda consumption. Perhaps due to their inclusion in tea, consumption of items from the dairy and sugar food groups is also higher in these divisions.

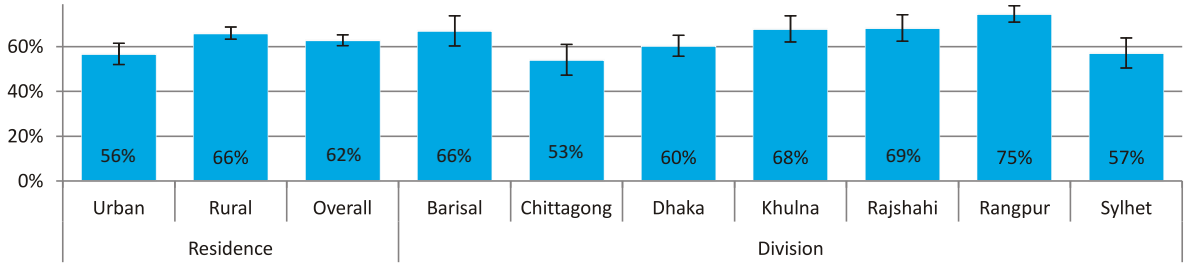
Figure 33: Maternal dietary diversity scores



A summary measure of dietary diversity is derived using a nine-item scale tested in Bangladesh by the FANTA-2 project in 2009 (29). Figure 33 displays the distribution of dietary diversity scores among mothers. The greatest number of mothers (31%) report having consumed four food groups in the previous 24 hours. The distribution also indicates that many more mothers report consuming more than four food groups than less than four food groups.

Because the overall micronutrient adequacy of women's diets was so poor in the FANTA-2 data set, the report was unable to identify a dietary diversity score above which dietary sufficiency was likely (29). Instead the report suggested a minimum cutoff of less than five as a point under which an individual was unlikely to have received a diet adequate in micro- and macronutrients. As mentioned in the methods section, this cut-off is used throughout the rest of the report.

Figure 34: Proportion of mothers consuming inadequately diverse diets



When this cut-off point for “inadequate dietary diversity” is applied by division, considerable variation is apparent (Figure 34). A smaller proportion of mothers from Chittagong and Sylhet consume inadequately diversified diets, in contrast to Rangpur where 75% of mothers are consuming inadequately diversified diets. When analyzed in terms of rural-urban differences, mothers living in urban areas have greater dietary diversity than those living in rural areas.

As shown in Figure 35, more educated mothers and those from wealthier households consume an inadequately diverse diet less often than less educated mothers and those from poorer households. However, even in the wealthiest group, 39% of mothers are not consuming an adequately diverse diet. The low percentage of women from even the wealthiest and most educated groups that fail to attain even this minimum threshold of dietary diversity is indicative of the monotonous diets of Bangladesh and point to a continuing need to scale up nutrition education activities.

Figure 35: Inadequate dietary diversity by wealth quintile and education

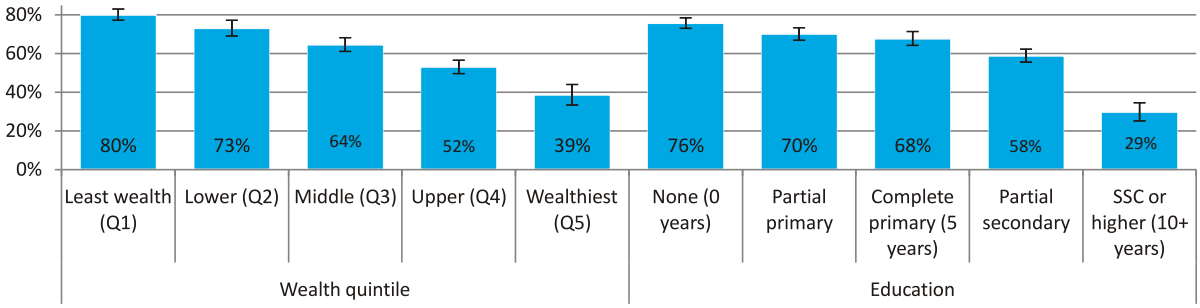


Figure 36: Inadequate dietary diversity by occupational group

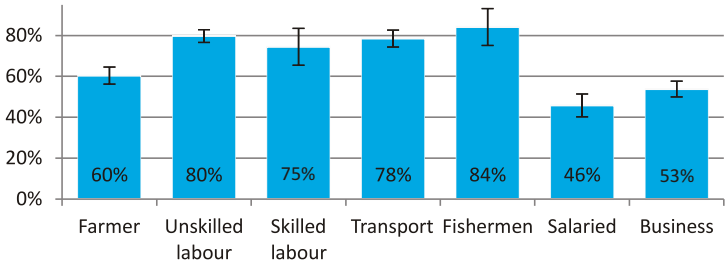
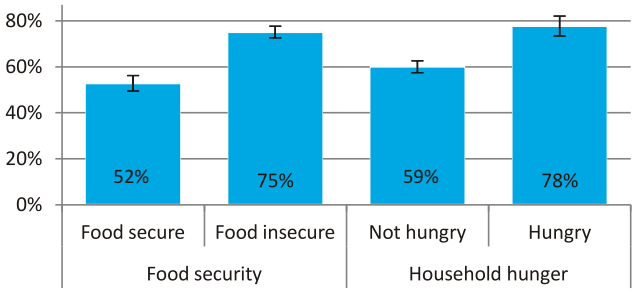


Figure 36 indicates that dietary diversity varies substantially by occupational group of the main income earner. Mothers from households that rely on more urbanized, salaried occupations consume an inadequately diverse diet less frequently, followed by those from households involved in business and farming occupations. Unskilled and skilled daily labour, transport and fishing occupations fare the least well in terms of dietary diversity.

Figure 37: Inadequate diet by food insecurity indicator



As expected, Figure 37 indicates that mothers from food insecure and hungry households consume inadequately diverse diets far more frequently than food secure households do. Of concern, however, is that even among food secure households, 53% of mothers report inadequate dietary diversity.

Maternal nutritional status

Over the last 16 years, the proportion of Bangladeshi mothers categorized as overweight has risen substantially, while the proportion of women categorized as calorie-energy deficient (CED) has progressively decreased. Figure 38 tracks these changes over time, although seasons of data collection vary (14; 45).[31] A landmark finding in the first round of FSNSP is that mothers are undernourished and overweight in equal proportion. Using 1999 BDHS as a point of comparison, in 10 years the proportion

31. During the winter season, when food is most plentiful, overweight would be at its peak and CED at its lowest point. In contrast, the last two rounds of the BDHS were administered during the summer lean season when CED is expected to peak. The 2005 CMNS estimates were obtained by sampling throughout all seasons providing a smoothed indicator.

of CED women has almost halved and the proportion of overweight women has more than doubled. This worrisome trend towards a double burden of malnutrition requires urgent attention (46; 47).

Figure 38: Trends in maternal CED and overweight (1996-2010)

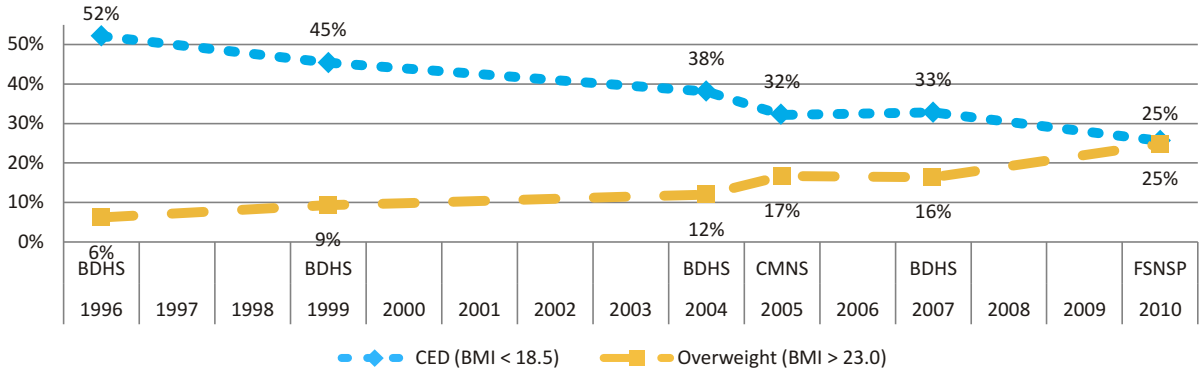


Figure 39: Maternal nutritional status by residence

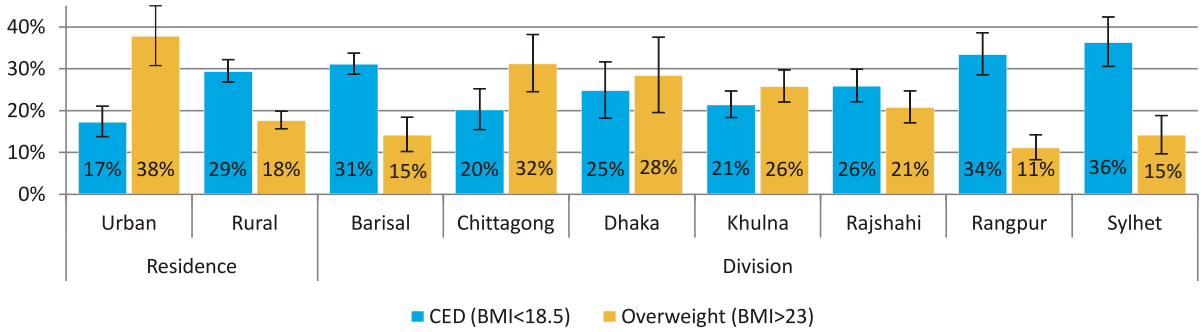


Figure 39 disaggregates maternal nutritional status by urban-rural residence and district. In urban areas, more than half the maternal population falls into either CED or overweight categories. In other words, only 45% of urban mothers have normal BMI. Indicative of the changing lifestyle, the proportion of overweight mothers is more than twice as large as those who are CED in urban areas. In rural areas, 53% of mothers are of normal BMI, 29% are CED and 18% are overweight. Divisional variation in malnutrition is also evident. In Barisal, Rangpur and Sylhet divisions many more mothers are CED than are overweight; in Chittagong, Dhaka and Khulna more mothers are overweight than CED.

Figure 40 shows that mothers from less wealthy households are more undernourished and less overweight than mothers from wealthier households. Interestingly, there is more variation in overweight by wealth quintile (9% to 48%) than there is variation in CED (13% to 38%), and even in the wealthiest quintile more than 10% of mothers are undernourished. Figure 40 also displays the proportion of mothers CED and overweight by their educational status. A higher proportion of less educated mothers are CED than more educated mothers, and the opposite is true for the proportion overweight.

Figure 40: Maternal nutritional status by education and wealth quintile

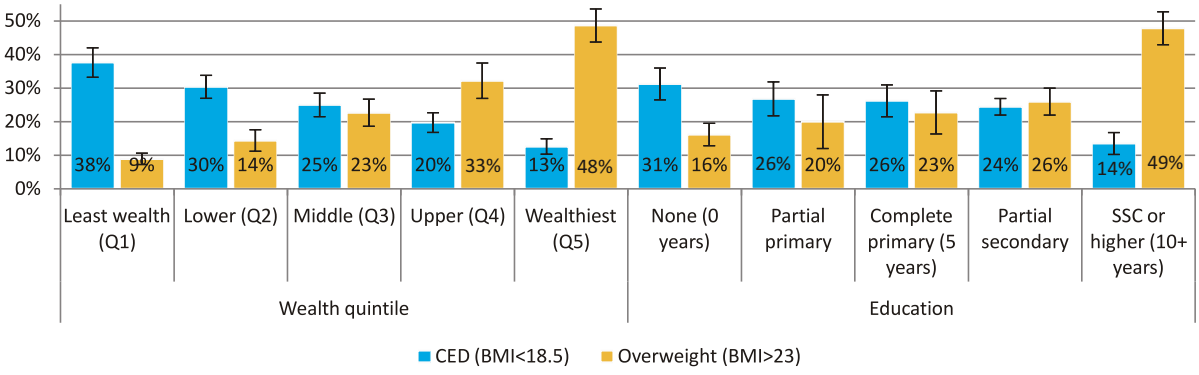


Figure 41: Maternal nutritional status by occupational group

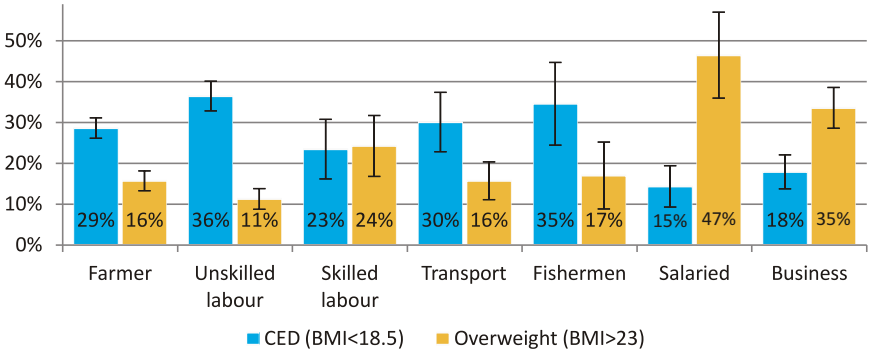
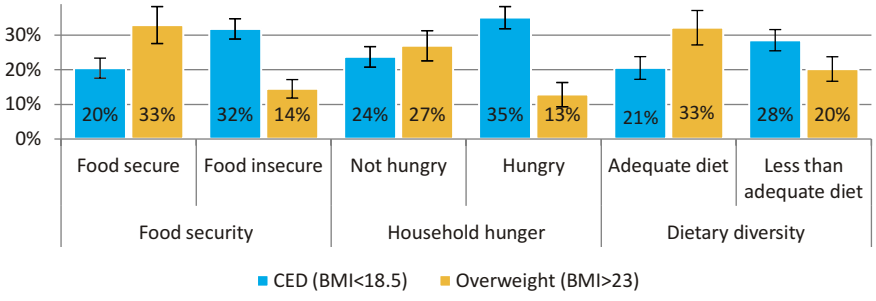


Figure 41 displays the proportion of CED and overweight mothers comparing households engaged in different occupational activities. With the exception of skilled labour, business and salaried work, in all other occupational groups at least 25% of women suffer CED. The occupational groups with the highest proportions of maternal CED and lowest proportions of overweight are those who farm their own land or are involved in unskilled labour, transport or fishing. Although farming households are less likely to be food insecure, mothers from these households are among the most malnourished.

Figure 42: Maternal nutrition status by indicators of food insecurity and diet



Maternal nutritional status also varies by household food security status and maternal dietary diversity. As shown in Figure 42, a substantial number of mothers from food secure households are CED (20%), although a greater percentage is overweight (33%). By contrast, food insecure and households with hunger have fewer overweight mothers and larger numbers with CED in approximately the same proportion (14% vs. 13% and 32% vs. 35%, respectively). The relationship between dietary diversity and maternal

nutrition exemplifies the complexities inherent in the double burden of malnutrition, with higher levels of overweight associated with greater dietary diversity, and higher levels of maternal CED associated with low dietary diversity.

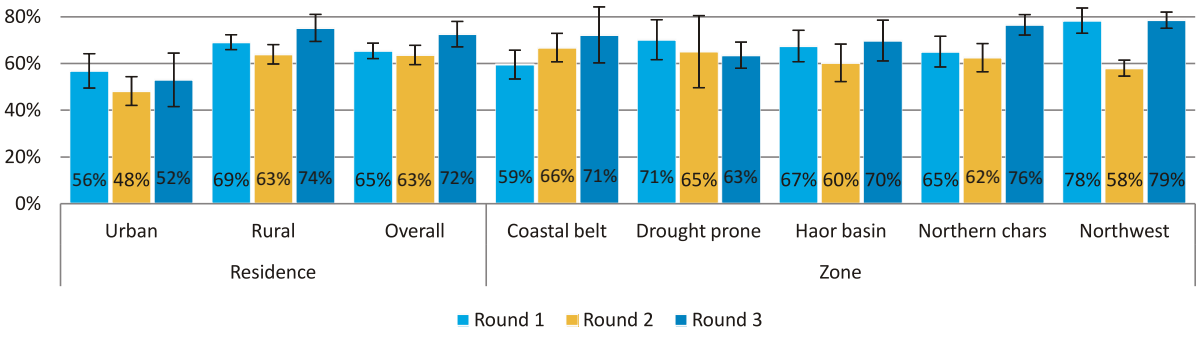
Seasonal variation in maternal care and nutrition

Over the three rounds of FSNSP in 2010, indicators of maternal diet and nutrition exhibit marked seasonal patterns within food insecure zones. In this section, seasonal changes in the proportion of women who consume a diverse diet and those who are CED and overweight will be assessed against urban-rural residence, food insecure zone and household food-security status.

Seasonal variation in dietary diversity

Figure 43 estimates the proportion of women who are consuming five or more food groups per round according to urban-rural residence and zone. With the exception of the Coastal belt, dietary diversity is greatest during the summer months (Round 2), while Round 1 diets are more diverse than Round 3 diets in all areas except for the Drought prone zone. A higher proportion of mothers in food secure households consume adequate diets than mothers in food insecure households, although more than half of women in food secure households still do not consume adequate diets (not shown).

Figure 43: Proportion of women consuming inadequate diet by season



Seasonal variation in nutritional status

Over the three seasonal rounds of data collection, the proportion of CED mothers rose steadily, while the proportion of overweight mothers varied, but with no clear seasonal trend (Figure 44 and Figure 45). Many more mothers are CED in the Northern chars and Haor basin compared to other zones such as the Northwest and Coastal belt. By contrast, the Coastal belt has a higher proportion of overweight and obese mothers than any other zone.

Figure 44: Proportion of mothers underweight by season

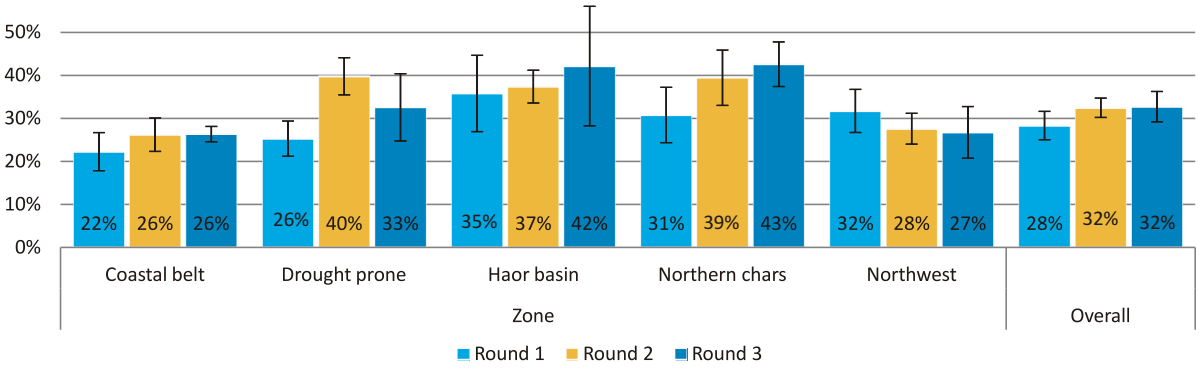
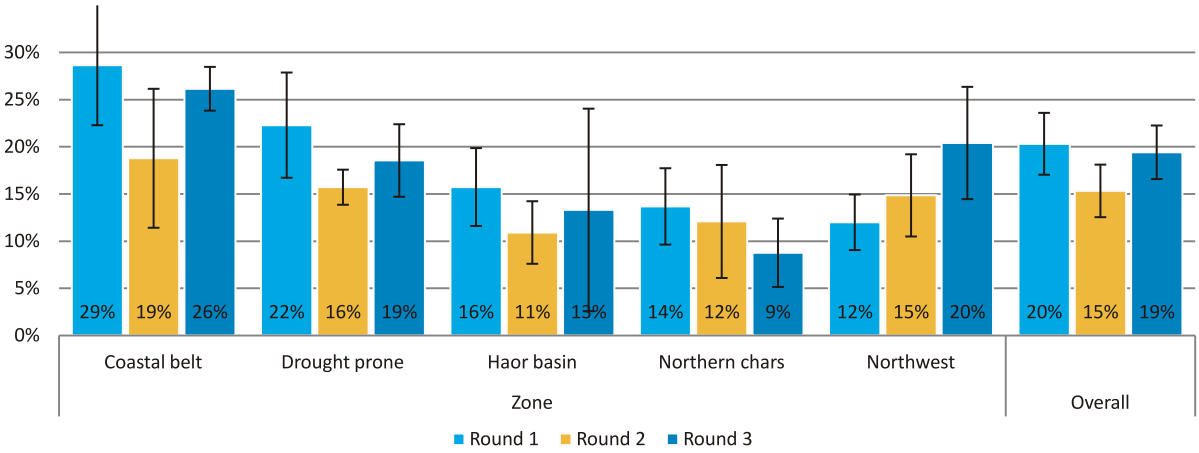


Figure 45: Proportion of mother's overweight by season

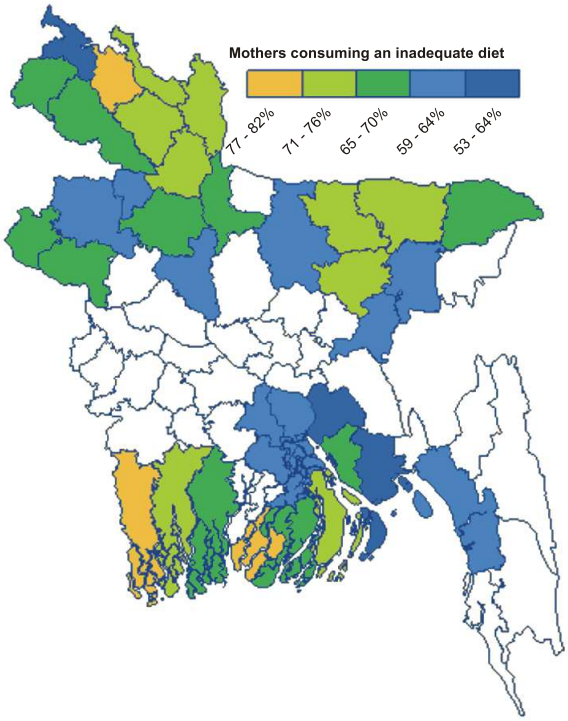


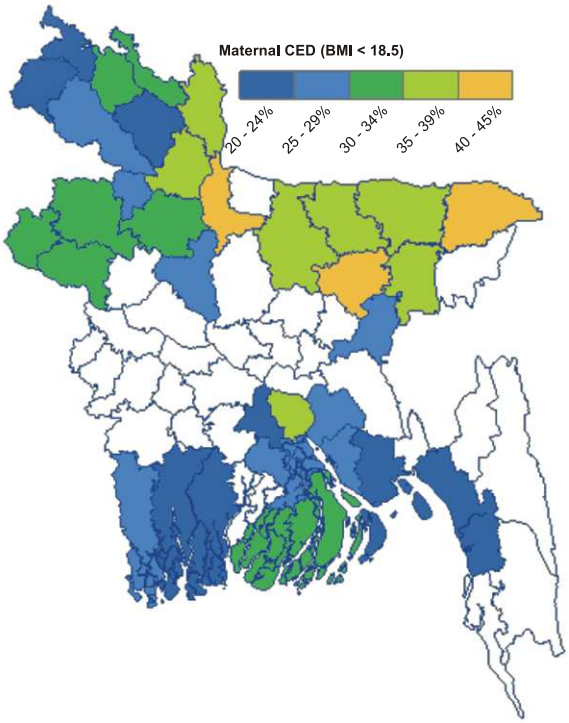
District level variation in maternal nutrition

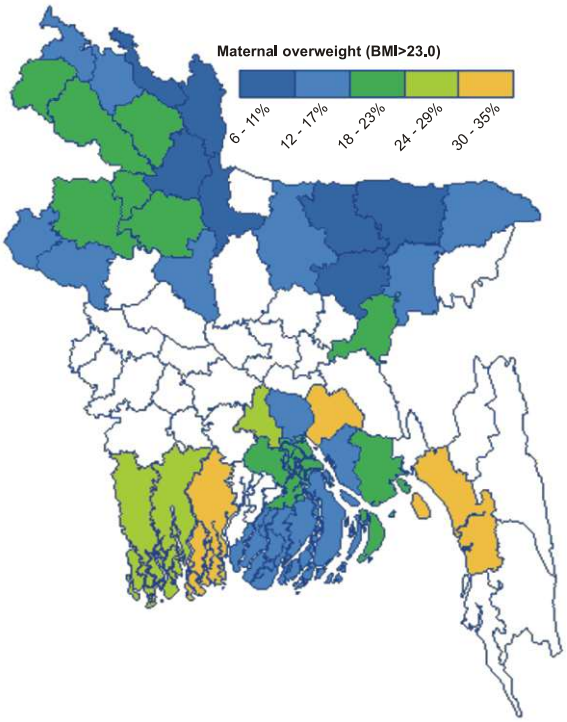
Figure 46 maps the comparative severity of the indicators discussed in this section by district. Pockets of low dietary diversity exist in the Haor basin, the western Coastal belt and the Northwest, whereas mothers in areas toward the centre of the country and in the more urbanized district of Chittagong have greater dietary diversity.

As expected, districts with comparatively greater proportions of mothers who are CED have comparatively lower proportions of mothers who are overweight and obese. Only the districts of Bogra and Naogaon have moderate levels for both indicators, and less than half of mothers are of normal nutritional status. The proportion of mothers who are CED is greater in the Northeast, and the proportion of overweight mothers is greatest in the Southwest, despite the very high prevalence of food insecurity in that area.

Figure 46: Maternal dietary and nutrition characteristics by district







Child care and malnutrition

National analysis

Child malnutrition is a result of a complex interaction between feeding and food consumption practices, child morbidity, and overall childcare practices. FSNSP collects measures on all of these to identify key points of intervention. In addition comparisons with earlier national surveys are presented so that progress and worrisome trends can be identified (14; 43; 3; 2; 5; 25; 4).

Child feeding

Adequate infant and young child feeding (IYCF) are vital to the physical and mental development of children. Nutritional deprivation during pregnancy and the first two years of life may result in developmental and health consequences that persist throughout an individual's lifetime. Because these deficits are difficult to reverse in later years, nutrition interventions delivered during this two year "window of opportunity" yield the greatest impact (48).

Figure 47: Child feeding practices in the first 23 months of life

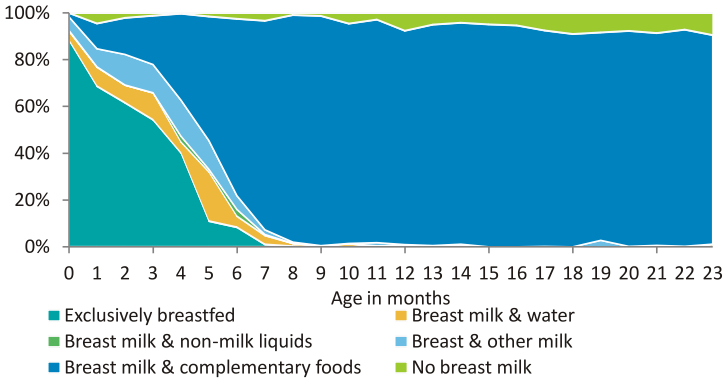


Figure 47 summarizes IYCF by age in months, indicating that the majority of children are breastfed throughout the first two years. In the FSNSP sample, all children in their first month of life are breastfed; the prevalence of exclusive breastfeeding, however, is less than 90% and the rate begins to decline before the second month of life. Before the fifth month of life more than 50% of children are exclusively breastfed. A minority of children are fed complementary foods from birth, and, before the sixth month, more than 50% are being fed family foods.

Early breastfeeding behaviours

Breast milk, especially colostrum or early breast milk, is vital for infant health as it provides all the nutrients a growing infant requires and strengthens the infant's immune system. In light of this, WHO recommends that infants begin breastfeeding within one hour of birth and remain exclusively breastfed for the first six months of life. Figure 48 displays trends in the proportion of children being fed in line with these recommendations over the last 17 years. The proportion of children who begin breastfeeding within one hour of birth has increased from steadily from 1999 to 2009. However FSNSP 2010 results indicate a worrisome decline in this recommended practice, with only 40% of newborns receiving breast milk within the first hour of life. By contrast, levels of prelacteal feeding have not changed between FSNSP 2010 and BDHS 2007 (50% and 53%, respectively; not pictured).[32] Rates of

32. Fed to the baby before breastfeeding has regularized, prelacteal foods are particularly dangerous to the growing infant as they can discourage early breastfeeding and introduce bacteria or other contaminates into the child's digestive system before his/her immune system has developed (48).

exclusive breastfeeding have improved only moderately in the last two decades. In 1993, 43% of children were exclusively breastfed for the first six months of life while in 2010 this proportion increased to 52%.

Figure 48: Trends in early breastfeeding practices (1993-2010)

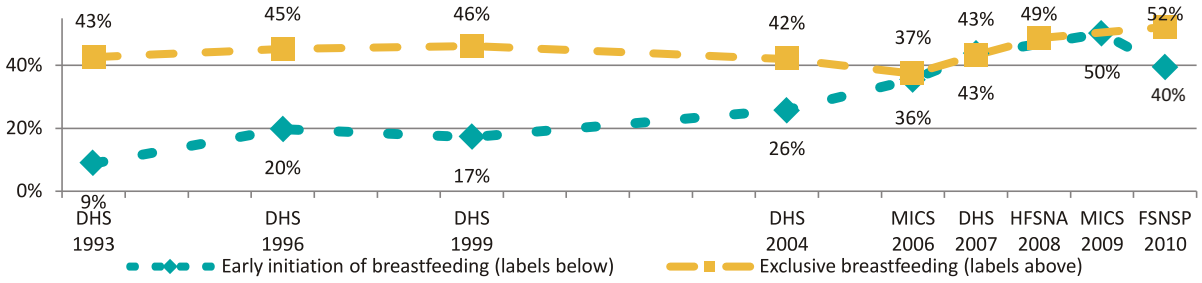


Figure 49: Early breastfeeding practices by residence

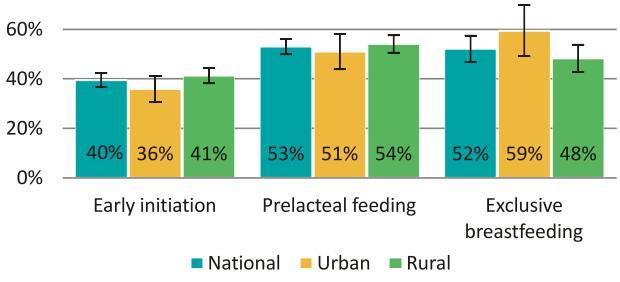


Figure 49 disaggregates early breastfeeding indicators by rural-urban residence. While a larger proportion of children living in rural areas are breastfed within an hour of birth compared to urban children, urban children are exclusively breastfed in greater proportions than rural children. No significant rural-urban differences in rates of prelacteal feeding are apparent.

Figure 50: Early breastfeeding practices by division

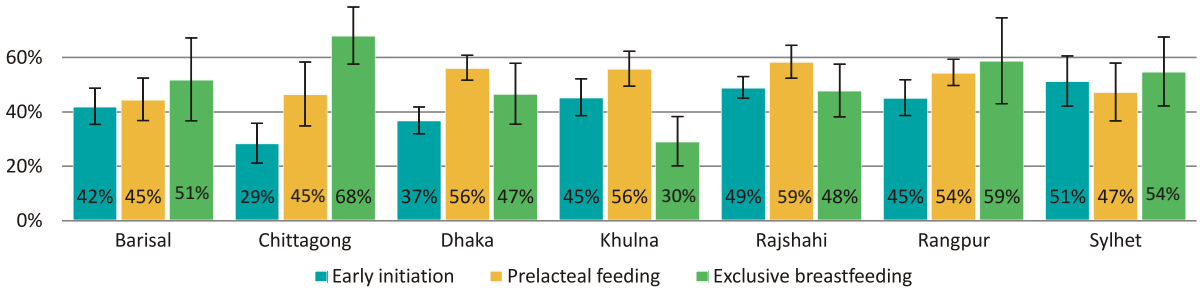
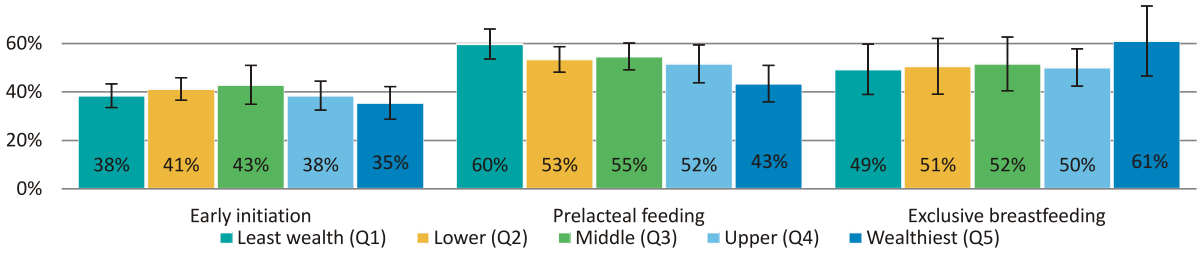


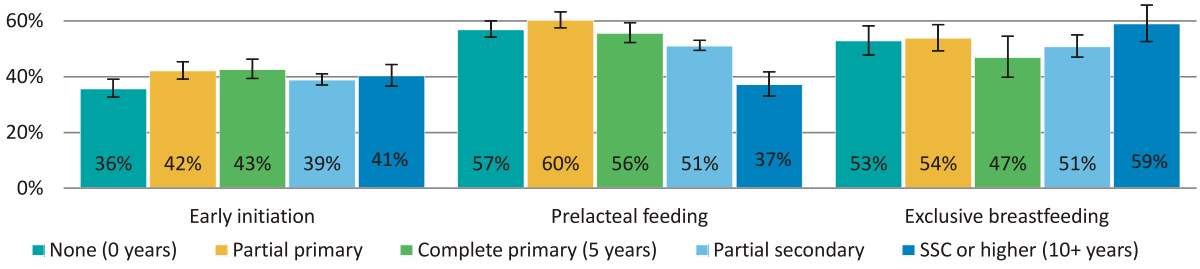
Figure 50 disaggregates the proportion of households that practice selected early breastfeeding behaviours by division. Rates of early initiation of breastfeeding are lowest in Chittagong although it ranks highest among divisions in the proportion of children who are exclusively breastfed. By contrast Khulna has average rates of early initiation of breastfeeding, but dangerously low rates of exclusive breastfeeding (30%). No notable differences in levels of prelacteal feeding are apparent between divisions.

Figure 51: Early breastfeeding practices by wealth quintile



As can be seen in Figure 51 and Figure 52, a limited association between increasing wealth and education and early breastfeeding behaviours exists. Children from less wealthy families or those whose mothers are less educated are given prelacteal feeds more often. In addition, mothers who have no education breastfeed their children within an hour of birth less often than more educated mothers. There is no significant difference in estimates for these indicators comparing male and female infants.

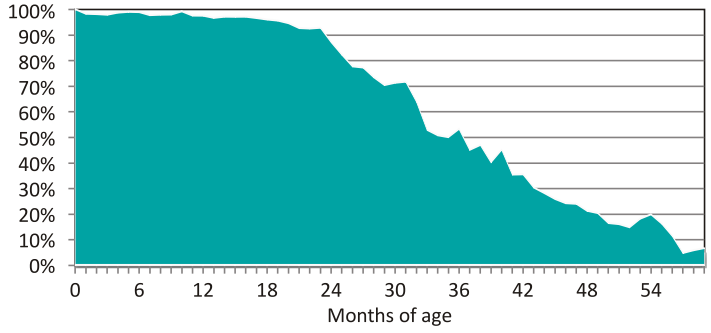
Figure 52: Early breastfeeding practices by maternal education



Continued breastfeeding

WHO recommends that a child continue to be breastfed through the second year of life, even after the child begins to receive complementary food. More than 90% of children are breastfed until the end of their second year of life, a high rate that has varied little over the past 17 years. More than 99% of children in Bangladesh are breastfed at least once in their lives and more than 10% of children are breastfed until the start of their fifth year of life. Figure 53 identifies the median age of discontinuation of breastfeeding in Bangladesh as 36 months. These results suggest that continued breastfeeding is a positive child-care practice in Bangladesh that must be supported, particularly as more women enter the workplace.

Figure 53: Proportion of children breastfed by age



In addition to encouraging breastfeeding, WHO discourages the use of bottles which are both difficult to clean in resource poor settings and facilitate the use of breast milk substitutes (formulas or animal milks). In Bangladesh, 15% of children under two years of age are bottle-fed, a proportion that has varied little in

recent years (16% and 18% according to BDHS 1999 and 2004 respectively). Little variation in the proportion of children bottle-fed is apparent between children living in rural and urban areas (14 vs. 15%, respectively).

While differences in breastfeeding practices are negligible comparing rural and urban settings (not shown) there is some variation by division (Figure 54). Children in Sylhet are weaned earlier and children in Dhaka are bottlefed more often than any other division in the country.

Figure 54: Proportion of children who continue to breastfeed and are bottle-fed by division

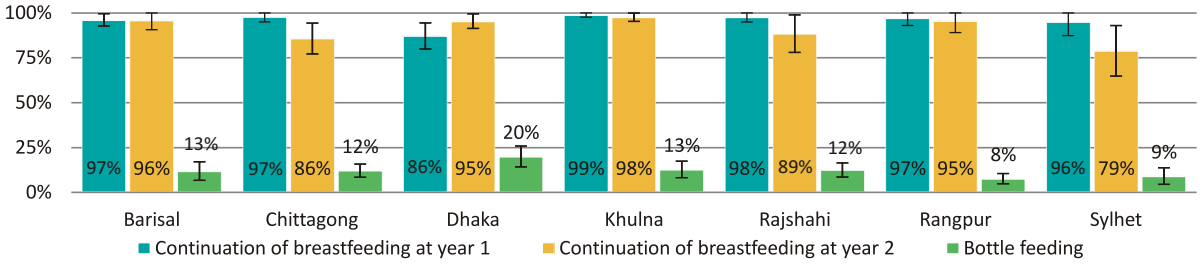
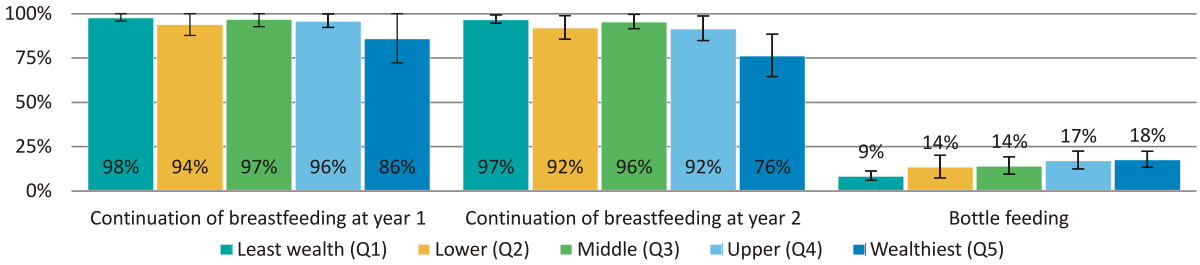
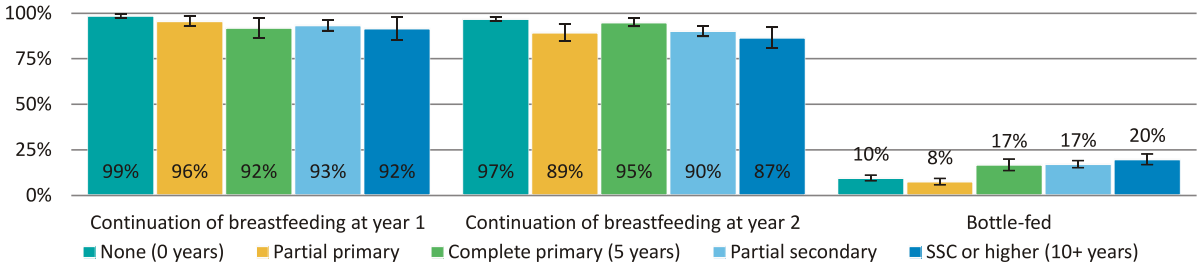


Figure 55: Proportion of children who continue to breastfeed and are bottle-fed by wealth quintile



Mothers from wealthier households and those with more education discontinue breastfeeding earlier and bottle feed their babies more often than mothers from poorer households and those who are less educated. In addition, a greater proportion of male versus female children are bottle-fed (17% vs. 11%, Adjusted Wald test p<0.0067) suggesting a bias towards male children given the misperception that costly breast milk substitutes are beneficial for health (49).

Figure 56: Proportion of children who continue to breastfeed and are bottle-fed by education



Complementary feeding

WHO recommends that children begin to be fed solid and semi-solid complementary foods in addition to breast milk at least twice a day from the sixth to eighth month of life, and three times a day thereafter. Furthermore, a diverse set of foods representing at least four of the seven food groups

(starches, legumes, dairy, flesh foods, eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables) is recommended to ensure adequate consumption of needed micronutrients.

Figure 57: Trends in timely initiation of complementary foods (1993-2010)

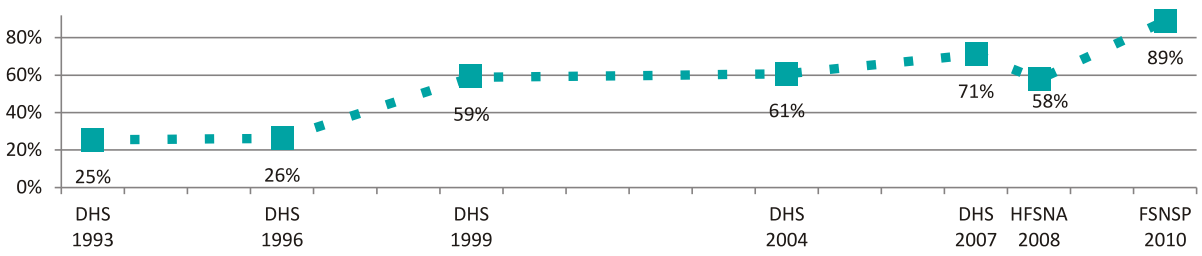
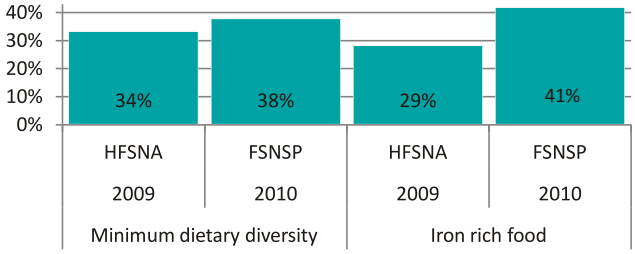


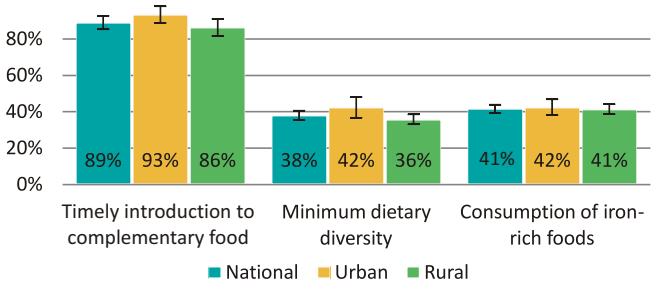
Figure 57 shows the long-term trend in the proportion of children six-to-eight months of age who have been fed solid or semi-sold foods, comparing results from FSNSP and past surveys. Use of complementary foods has been increasing since 1996 with a particularly sharp improvement occurring between HFSNA 2008/2009 and FSNSP 2010. Figure 58 explores the nature of this short-term improvement by comparing the proportion of children who have been fed a diverse diet and those who have eaten iron-rich foods.[33] While the positive trend in these indicators is heartening, as is the absence of gender differences in feeding practices, less than half of the children are receiving an adequately diverse diet and consuming iron-rich foods.

Figure 58: Quality of complementary foods (2009- 2010)



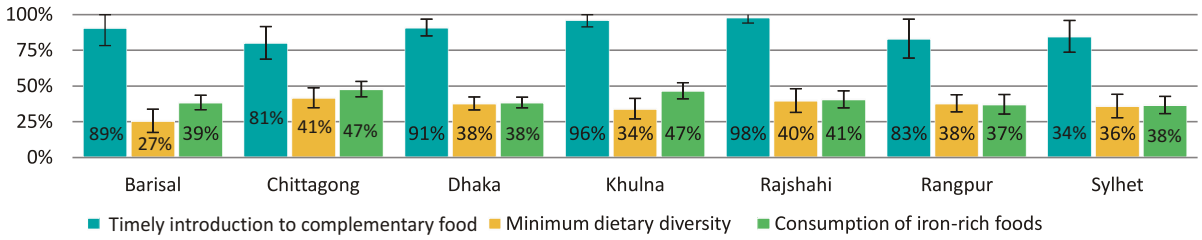
Consistent with urban-rural differences in maternal dietary diversity, urban-dwelling children have a more diverse diet than children from rural areas do, although there is no difference in consumption of iron-rich foods. Rural children are also introduced to family foods later. Notable differences in children's complementary feeding practices are evident across divisions (Figure 60). Fewer children in Chittagong, Rangpur and Sylhet eat family foods from six-to-eight months of age than children in other divisions, while only around a quarter of the children in Barisal eat an adequately diverse diet.

Figure 59: Complementary feeding practices by residence



33. Long-term trends are not available because in past surveys a different methodology was used to collect dietary diversity.

Figure 60: Complementary feeding practices by division



Variations in household wealth and maternal education have limited effects on the timing of introduction to complementary foods or the consumption of iron-rich foods, thus emphasizing the programmatic importance of addressing knowledge gaps around complementary feeding irrespective of socioeconomic group. As might be expected, a greater proportion of children from wealthier households and those whose mothers have more education consume diverse diets. No difference exists in these feeding practices between male and female children.

Figure 61: Complementary feeding practices by wealth quintile

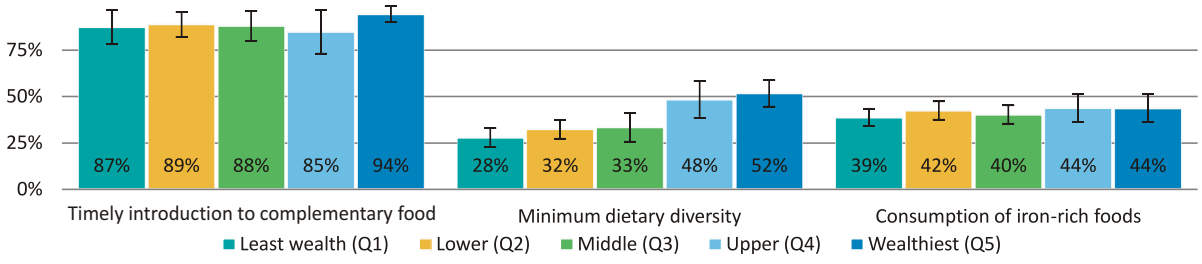
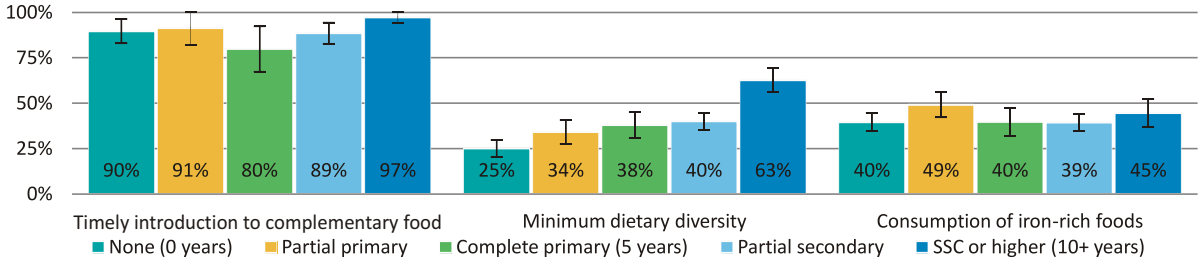


Figure 62: Complementary feeding practices by maternal education



Child morbidity

A frequently sick child is much more likely to become malnourished due to reduced appetite as well as a decreased ability to absorb nutrients consumed. Figure 63 disaggregates the proportion of children who have been ill in the past two weeks by rural and urban residence. Overall, fewer children suffer from acute respiratory infection (ARI) and diarrhoea than fever, and illness rates are slightly lower in urban versus rural areas. More than two-thirds of children sick with diarrhoea are treated at home, irrespective of urban-rural residence.

Figure 63: Proportion of children ill by residence

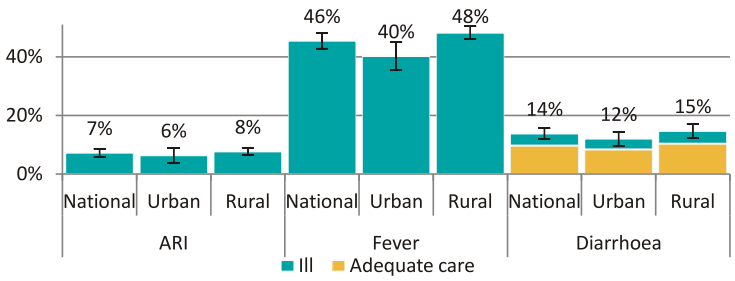
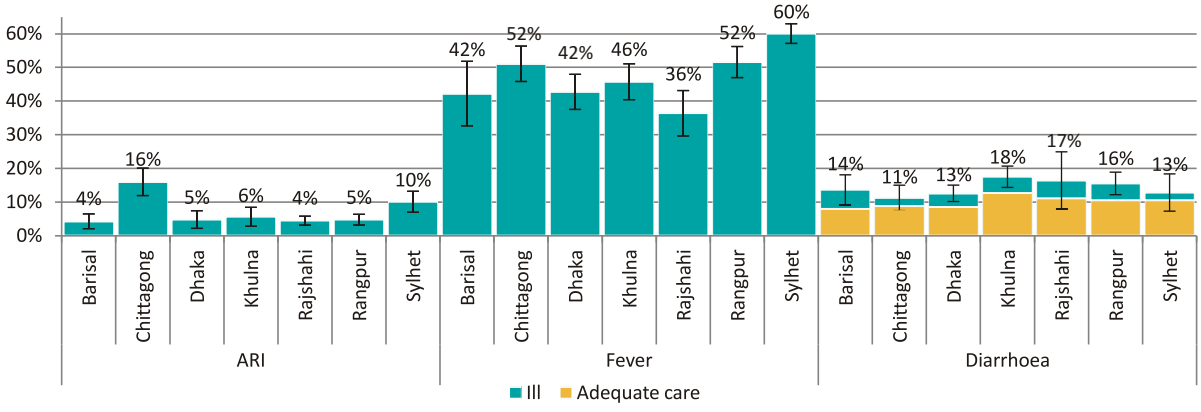


Figure 64 presents rates of illness in the last two weeks by division. Much greater variation exists between divisions in rates of childhood fever and ARI than diarrhoea. Amongst all divisions, Chittagong reports the greatest prevalence of ARI (16% compared to 8% nationally), and Sylhet reports the highest rates of fever (60% compared to 48% nationally) as well as higher than average rates of ARI. By contrast, Rajshahi has the lowest rates of reported fever (36%) and slightly below average rates of ARI. Diarrhoea is most common along the western side of the country (Khulna, Rajshahi and Rangpur) and lower in the more urbanized divisions of Chittagong and Dhaka. Once again, more than two-thirds of children suffering diarrhoea are reported to have received adequate home care in all divisions except Barisal (only 58%).

Figure 64: Proportion of children ill by division



As shown in Figure 65, rates of reported child illness are lower in wealthier households. Comparing wealth quintiles, fewer children suffer from fever (40% vs. 49% in the poorest group) and ARI (6% wealthiest vs. 8% poorest) in the wealthiest households. While wealthy households report slightly lower rates of childhood diarrhoea (13% vs. 17% in poor households), there is no clear association between increasing wealth and the probability of receiving minimally adequate home care, such as oral rehydration salts (ORS).

Figure 65: Proportion of children ill by wealth quintile

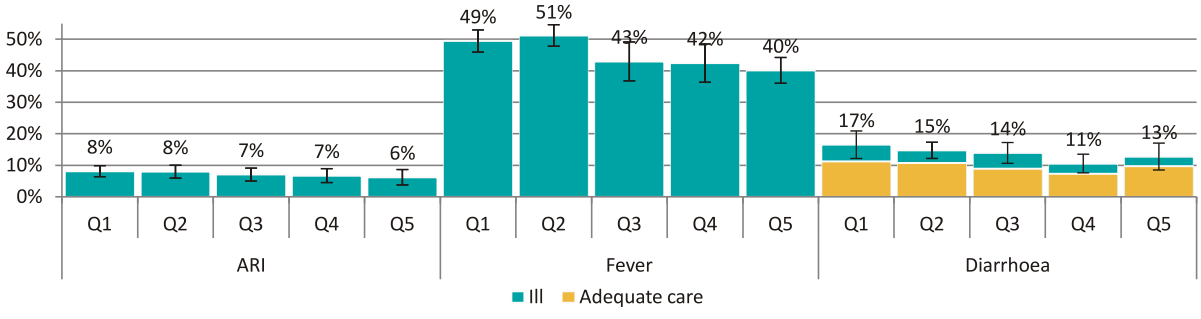
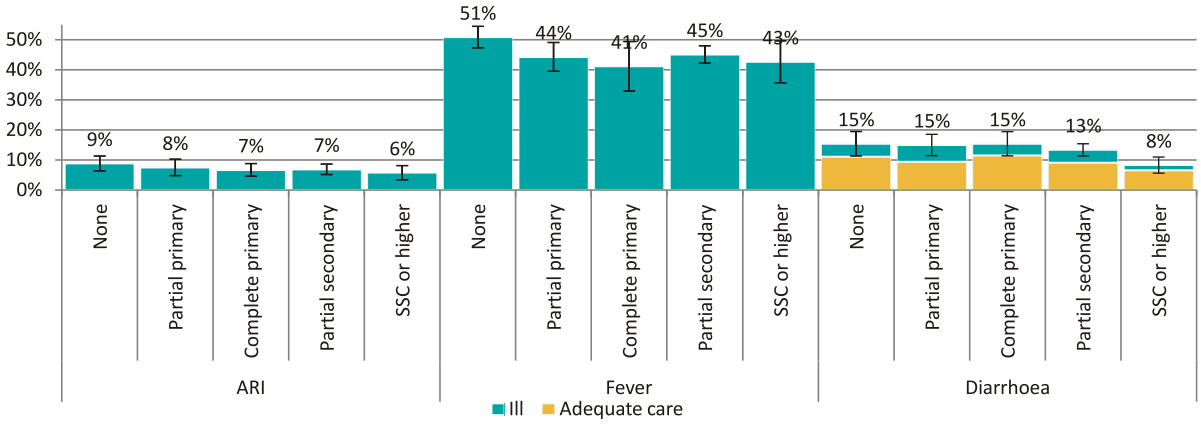


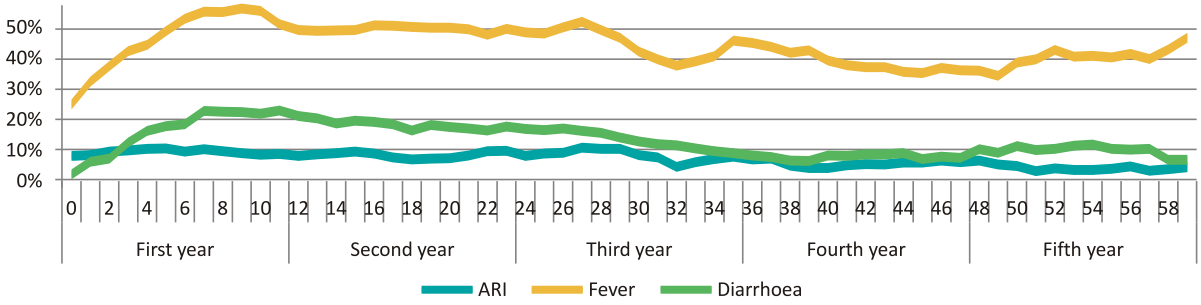
Figure 66 depicts a similar pattern in the proportion of children who are ill by mother's education. The proportion of children ill with diarrhoea reduces dramatically from 13% to 8% between the maternal education categories of partial-secondary and secondary-school completion. In addition, the proportion of sick children who do not receive adequate home care is only 1% of children whose mothers have completed secondary school, while it is 4% for children of uneducated mothers, and 3% for children of mothers who have completed primary school.

Figure 66: Proportion of children ill by maternal education



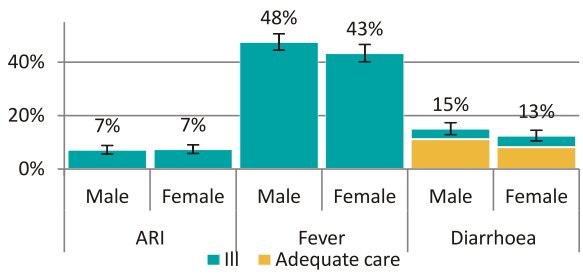
As shown in Figure 67, the proportion of children reporting illness in the last two weeks tends to decline with increasing age. Fever is much more common among younger children, especially those in their first year, and gradually decreases in prevalence in older age groups. Diarrhoea and ARI, on the other hand, show much less variation by age with a slightly greater proportion of children sick with diarrhoea and ARI during the first 2.5 years of life. The high proportion of children ill at the youngest ages is especially troubling as this represents the most critical period of child development.

Figure 67: Proportion of children ill by age in months



As depicted previously in Figure 47, for most children discontinuation of exclusive breastfeeding in Bangladesh begins well before the recommended six months. The increase in diarrhoea rates between the third and fourth month of life is most likely linked to contaminated complementary food and drinks. While 8% of children under six months of age who are exclusively breastfed suffer from diarrhoea, 14% of children who are not exclusively breastfed were ill with diarrhoea in the last two weeks (Adjusted Wald test $p < 0.034$). Moreover, the timing of the increase in diarrhoea corresponds to the timing of reduction in exclusive breastfeeding; as exclusive breastfeeding rates fall to 11% in the fifth month of life, diarrhoea rates triple to 29%.

Figure 68: Proportion of children ill by sex of child

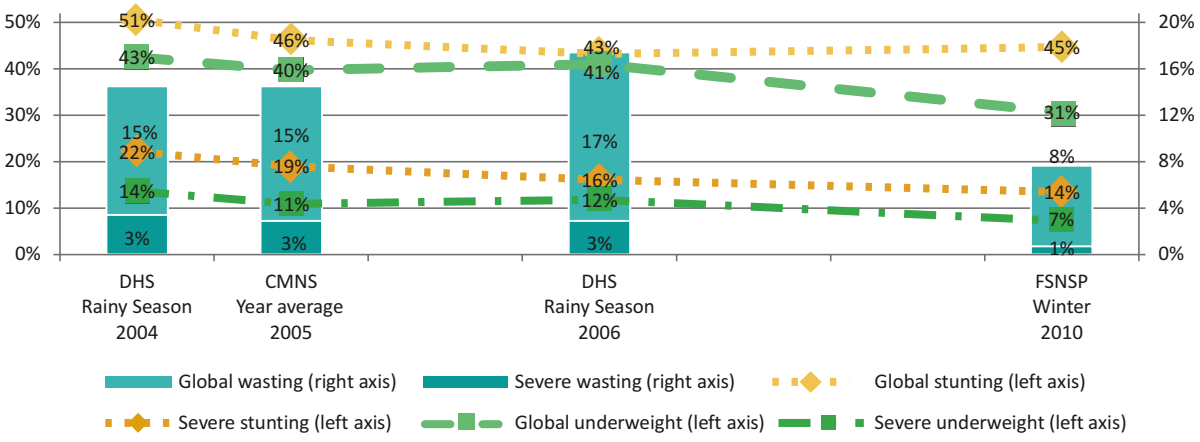


Gender differences in the proportion of children ill with fever and diarrhoea and in home care for children sick with diarrhoea are apparent in Figure 68. Female children tend to report diarrhoea and fever less often than male children; however, it is unclear whether this difference is due to underreporting of illness for female children or to gender differences in risk factors or immunity (50). Also troubling is the finding that female children receive adequate home care for diarrhoea less often than male children do (66% vs. 74%).

Child nutrition

As shown in Figure 69, only modest improvements in rates of child malnutrition have been observed over the last six years in Bangladesh.[34] From 2004 to 2010, the prevalence of chronic child malnutrition, or stunting, has declined from 51% to 45%, a 10% reduction. Over the same timeframe, the prevalence of child underweight appears to have improved even more quickly (43% to 31%); but, due to the effects of seasonality, the actual reduction is probably in the same range as stunting. The prevalence of wasting varied greatly over 2010 with no clear trend, but it is most likely linked to the seasonality of survey administration. Translating these proportions into real numbers, during Round 1 of FSNSP, well over 7 million children were stunted, almost 5 million children were underweight, and almost 200,000 children were wasted.[35]

Figure 69: Recent trends in prevalence of child malnutrition



34. All results shown here use the WHO standard. Because these surveys were administered in varying seasons, the results for child acute malnutrition (wasting) are not directly comparable to one another.

35. Not pictured in Figure 69 is child overweight, which has not changed much over the past 6 years and is still extremely low in Bangladesh. FSNSP results indicate that less than 1% of children under five years of age are overweight (BMI-for-age).

Figure 70: Prevalence of child malnutrition by residence

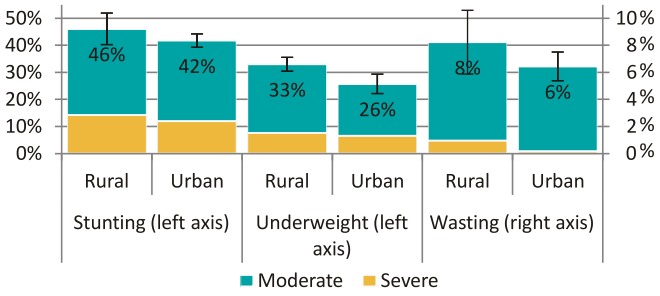


Figure 70 disaggregates measures of child malnutrition by rural and urban residence, and Figure 71 disaggregates estimates by division. As expected, a greater proportion of rural children are malnourished than those living in urban areas. Comparing divisions, Khulna, Rajshahi and Dhaka stand out as having the lowest prevalence of stunting, and Chittagong, Khulna, Rajshahi and Dhaka have the lowest rates of child underweight. Wasting is least common in Chittagong and Dhaka and most common in the far northern divisions of Rangpur and Sylhet.

Figure 71: Prevalence of child malnutrition by division

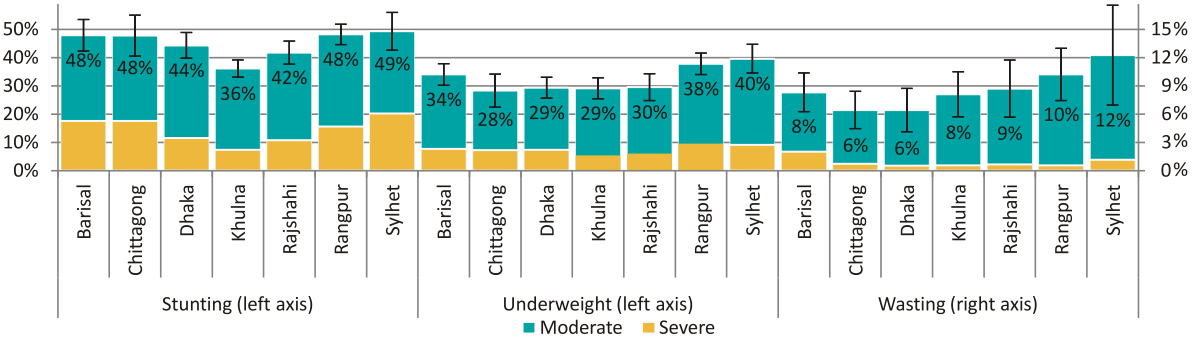


Figure 72 displays high levels of child malnutrition across every wealth quintile, and a strong gradient in risk of malnutrition with decreasing household wealth. However, even in the wealthiest quintile, 27% of children are stunted, 18% are underweight, and 7% are wasted; indicating that there are more complex constraints to proper child nutrition than just access to food.

Figure 72: Prevalence of child malnutrition by wealth quintile

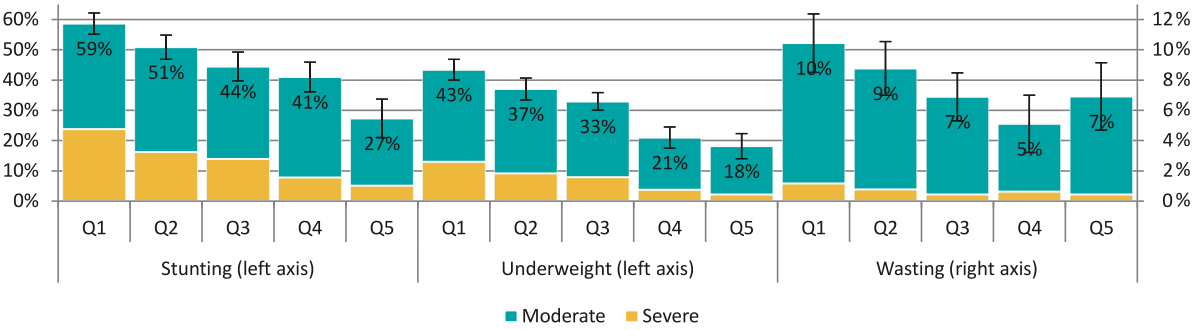


Figure 73 presents the proportion of children malnourished according to the educational attainment of their mothers. As expected, children of educated mothers fare better than children with less educated mothers, with rates of malnutrition among children of mothers who have passed secondary school less than half those whose mothers have not gone to school.

Figure 73: Prevalence of child malnutrition by maternal education

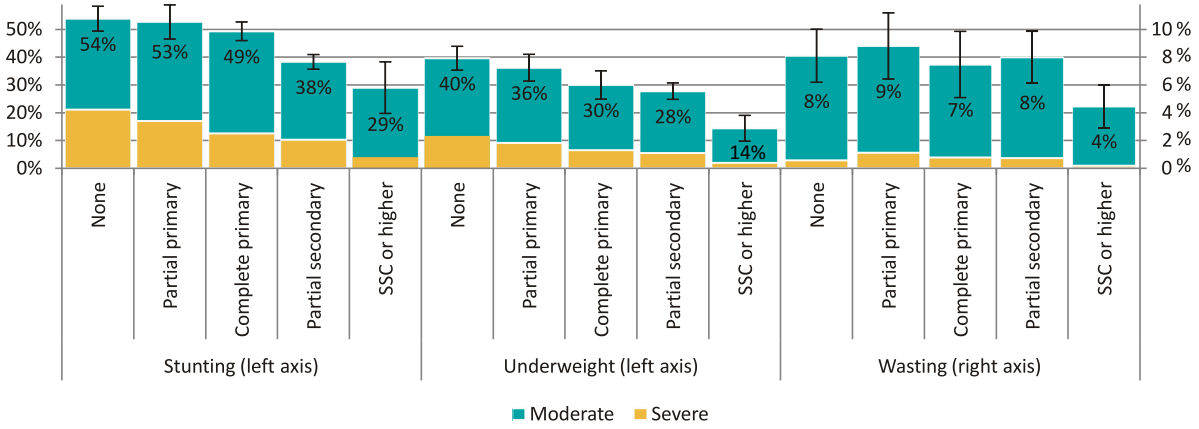
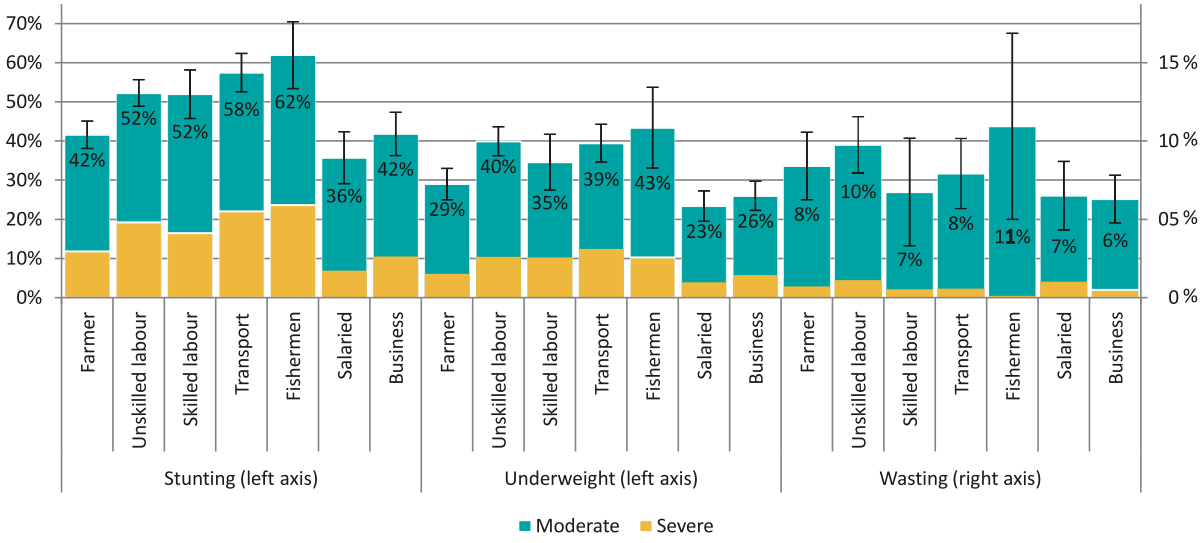


Figure 74 breaks down indicators of child malnutrition by the occupation of the main income earner. Similar to patterns observed for household food insecurity, families reliant on salaried, business and farming income have lower rates of stunting than households dependent on day labour, transport or fishing. The pattern for child underweight is the same; while little occupational variation is apparent for wasting.

Figure 74: Prevalence of child malnutrition by occupational group



Associations between child nutritional status, recent child illness and gender are largely unremarkable, and thereby not presented. The only exception is significantly greater wasting in children who had recently experienced diarrhoea compared to those who had not been ill (10% vs. 7%; Adjusted Wald test $p<0.0408$). No significant difference in levels of malnutrition between male and female children is apparent (wasting 8% vs. 7%, stunting 44% vs. 45%, underweight 30% vs. 32%, respectively).

Figure 75 illustrates the relationship between child malnutrition and household food insecurity and hunger. While food insecure households experience greater rates of child malnutrition, the high prevalence of stunting, underweight and wasting, even among food secure households, is extraordinary. Clearly, food insecurity contributes to child malnutrition, but the causes of malnutrition are far more complex.

Figure 75: Prevalence of child malnutrition by household food insecurity and hunger

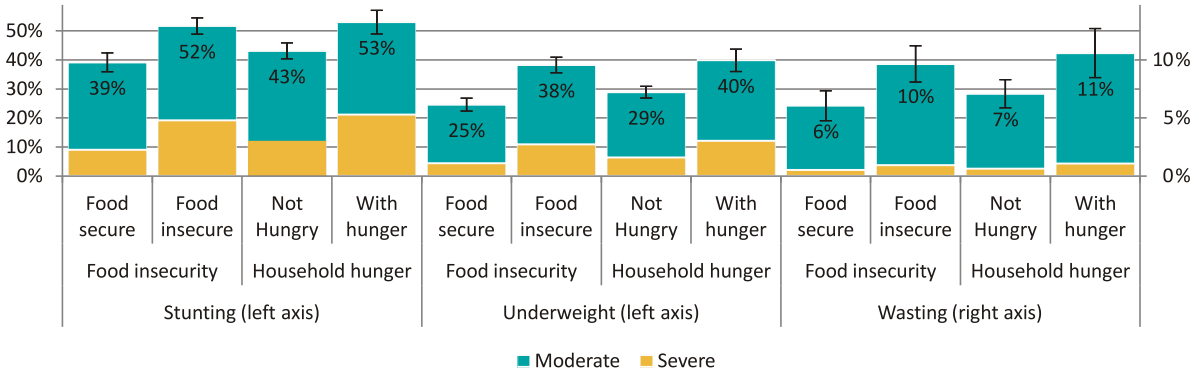
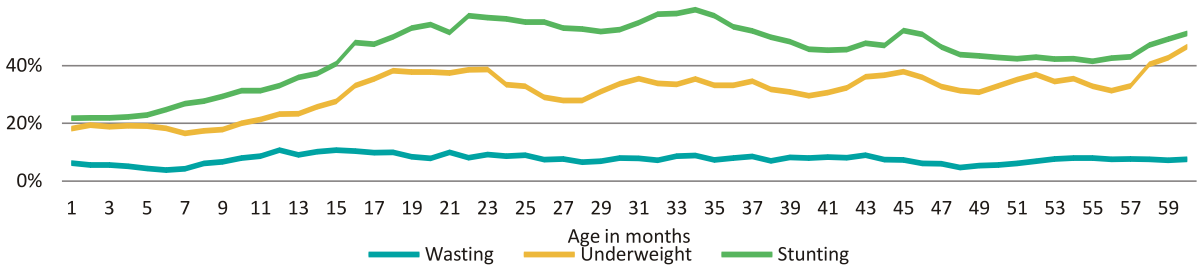


Figure 76 displays the prevalence of child malnutrition by age. The proportion of children wasted increases until around the 12th month, stabilizes around 10% until the start of the third year of life, and then slowly declines. Child underweight is stable for the first 10 months at around 20% and then increases to between 30% and 40% until five years of age. Child stunting shows a similar pattern, though this indicator begins to rise in the fifth month and peaks between the 21st and 36th months. This trend differs somewhat from that of the 2007 DHS where a more prominent peak of wasting occurs during the second year and rates of underweight and stunting increase more gradually.

Figure 76: Prevalence of child malnutrition by age (5 month moving average)



FSNSP includes birthweight information for children whose weight was taken within three days of birth and recorded or remembered. During Round 1, 12% (1,484) of caregivers were able to provide the birth weight of their child. These women tended to be wealthier, more urban and more educated than average (not shown).

Figure 77: Prevalence of child malnutrition by birth weight

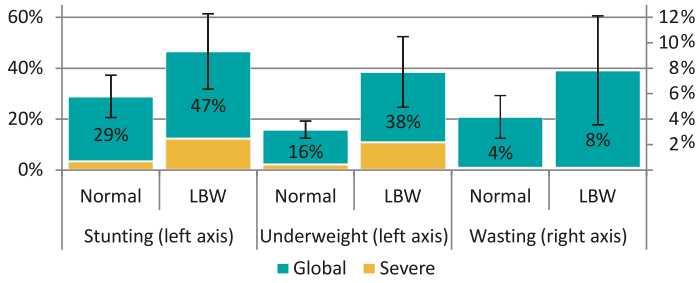


Figure 77 presents the percentage of children malnourished by the child's weight category at birth. Children with low birth weight (LBW) experience greater rates of child malnutrition than children whose birth weight is equal or greater than 2.5 kgs>, the cut-off point for LBW. Given the relatively well-off status of children for whom birth weight data was available, this finding emphasizes the need to focus on child nutrition before birth.

Tracking MDG 1

Given that the MDG goal to reduce child underweight was set in 1990, long before the 2006 WHO reference population was established, the goal uses the older NCHS/CDC reference population to determine the prevalence of underweight children in all countries.[36] The prevalence estimates of child malnutrition presented here are not the same as those presented earlier in the section because of differences in the reference populations.

Figure 78: Long-term trends in child malnutrition in Bangladesh (NCHS reference, 6-59 months)[37]

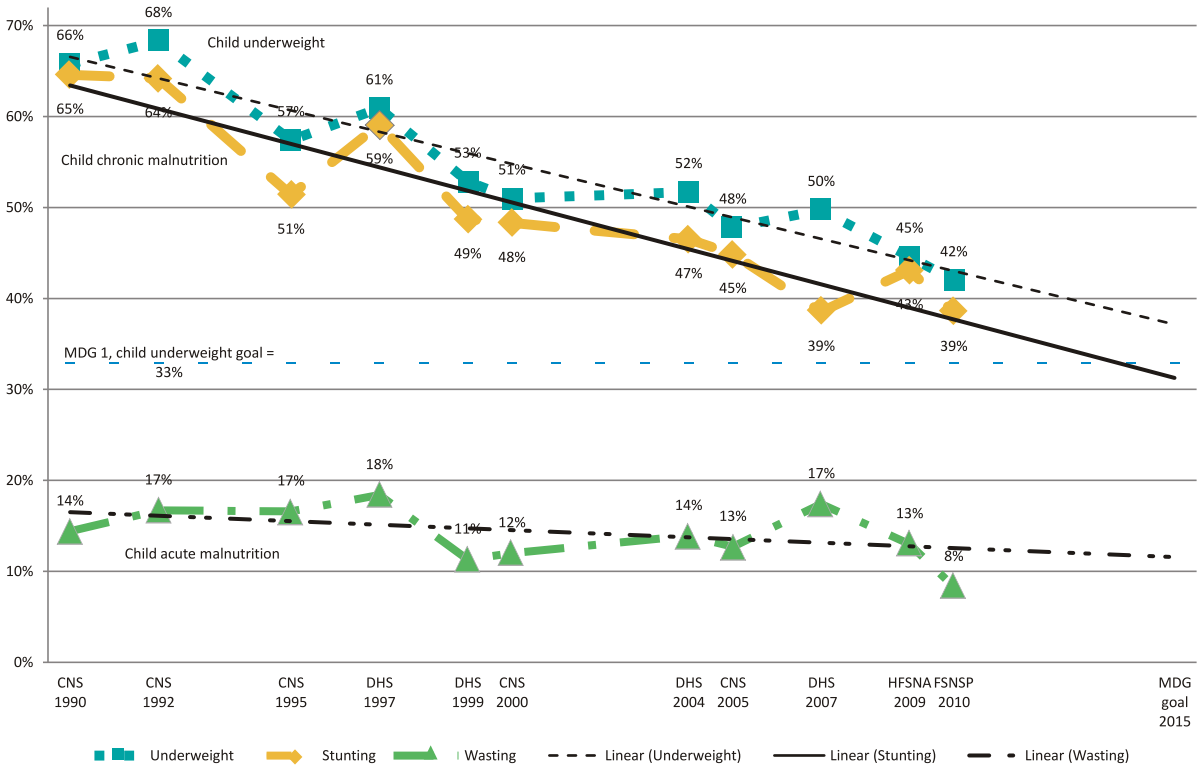


Figure 78 tracks changes in three estimates of child malnutrition from 1986 until Round 1. Rates of child underweight have reduced steadily, and a slightly steeper reduction can be seen in rates of stunting while there has been a very limited decline in rates of wasting. Unfortunately, the rate of reduction in child underweight (1.2 percentage points a year) continues to fall short of the MDG goal 1 that requires

36. Additional details of the differences in estimates of malnutrition based on the two reference populations are available in the appendix (page 94).

37. Though the MDG goal refers to reducing child underweight for all children under 5, In Bangladesh this goal has been tracked only for the age group 6 to 59 months, because the MDG benchmark survey in 1990 only included children 6 to 72 months.

a decline of a little over 1.3 percentage points a year. To meet this goal, this rate of reduction will need to increase to 1.8 percentage points per year, an increase of 50% over the current rate, which is feasible if action is taken now.

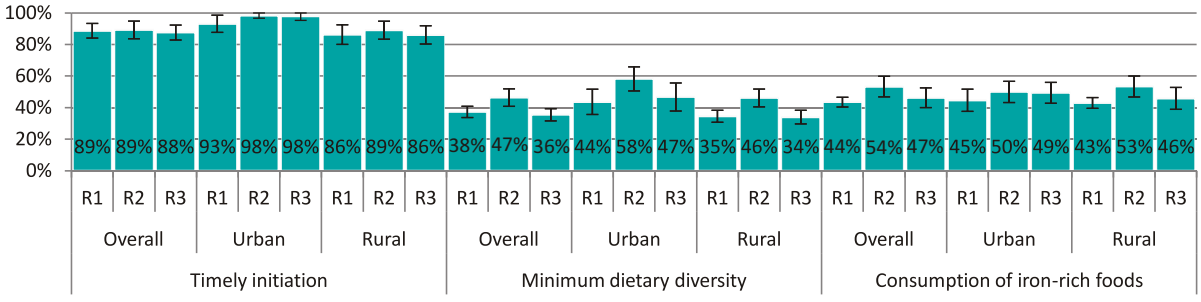
Seasonal variation in child care and nutrition

In the interest of brevity, the following section will focus on select indicators that show seasonal variation. All other indicators are available in the accompanying book ***State of Nutrition and Food Security in Bangladesh: Summary Statistics 2010***.

Seasonal variation in child feeding

There is little variation in child feeding practices across seasons with the exception of small but significant changes in complementary feeding practices. Figure 79 displays these by round and rural-urban residence. A slightly higher proportion of children were fed complementary foods in Round 2 than in rounds 1 or 3. Similarly, during Round 2 more children were fed a minimally diverse diet and iron-rich foods. This pattern is similar to the seasonal variations observed in the diversity of the mother's diet.

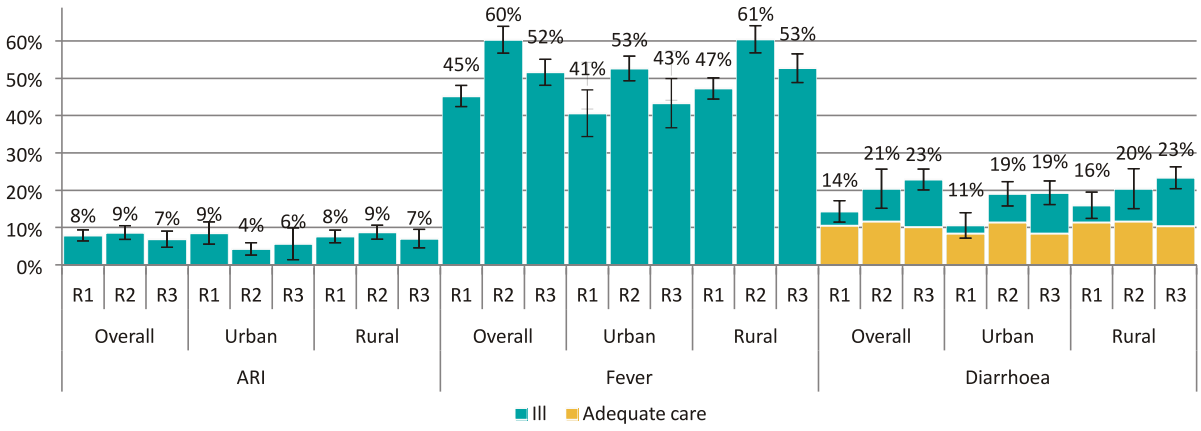
Figure 79: Seasonal variation in complementary feeding practices



Seasonal variation in child morbidity

Figure 80 illustrates seasonal variation in child illness by urban-rural residence. The proportion of children experiencing ARI and fever is greatest during Round 2, but the proportion of children suffering diarrhoea steadily increases throughout the year and is greatest during Round 3. The same patterns are seen in urban and rural areas and persist across all wealth quintiles (not shown).

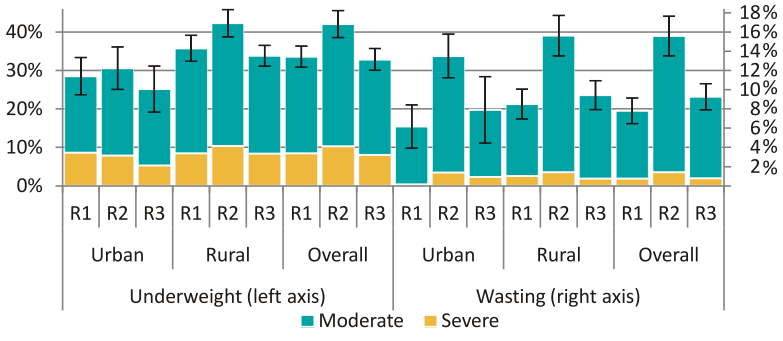
Figure 80: Seasonal variation in child illness by residence



Seasonal variation in child nutrition

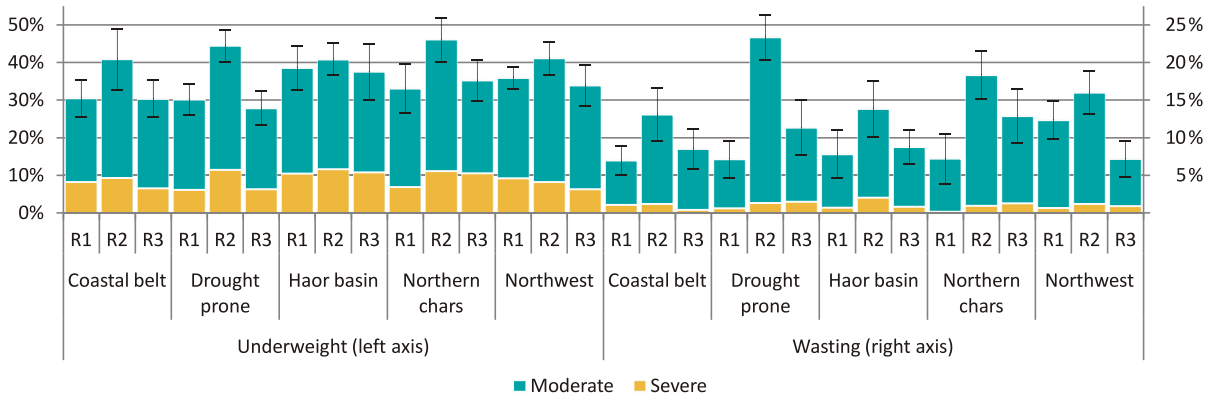
Child wasting and underweight vary substantially over the seasonal rounds of surveillance. Rates of child underweight in rural areas show the greatest variation compared to urban areas, while seasonal patterns of child wasting are quite similar (Figure 81). The proportion of children acutely malnourished doubles between Round 1 and Round 2 before returning to a level similar to Round 1 in Round 3. As might be expected, less wealthy households have a larger spike in wasting malnutrition during the monsoon season than wealthier households (not shown).

Figure 81: Seasonal variation in child malnutrition by residence



The increase in rates of malnutrition in Round 2 varies between food insecure zones, as shown in Figure 82. The largest increase is apparent in the Drought prone zone, where wasting rose from 7% during Round 1 to 23% during Round 2 before falling back to 12% in Round 3. Notably, the Drought prone zone is also the area which experienced the largest increase in household food insecurity between Rounds 1 and 2. A sizable but smaller variation in global child underweight is evident across all zones.

Figure 82: Seasonal variation in child malnutrition by zone



District level variation in child care and nutrition

Figure 83 displays selected early breastfeeding behaviours. While Sirajgang has comparatively better rates of early initiation of breasting, harmful practices such as prelacteal feeding and low rates of exclusive breastfeeding are widespread. Other northern districts such as Jamalpur and Lalmonihat rank poorly on all three early breastfeeding indicators, while three districts of the southwestern coastal belt (Satkhira, Khulna and Bagerhat) have extremely low rates of exclusive breastfeeding.

Figure 84 depicts complementary feeding practices by district. The proportion of children bottle-fed is low throughout the country, but is most common in Kishoreganj and least common on the extreme east and west of the country. Most districts have similar high rates of timely introduction to complementary food with the exception of a central belt that stretches from Lalmonirhat to Bhola. Considerable district-level variation in dietary diversity and iron consumption is evident. Districts of the Haor zone have the lowest rates of dietary diversity and lower than average rates of iron consumption. The consumption of iron-rich foods is also low in Madiripur, Shriatpur and Barisal of the central Coastal belt.

Figure 83: Breastfeeding practices by district

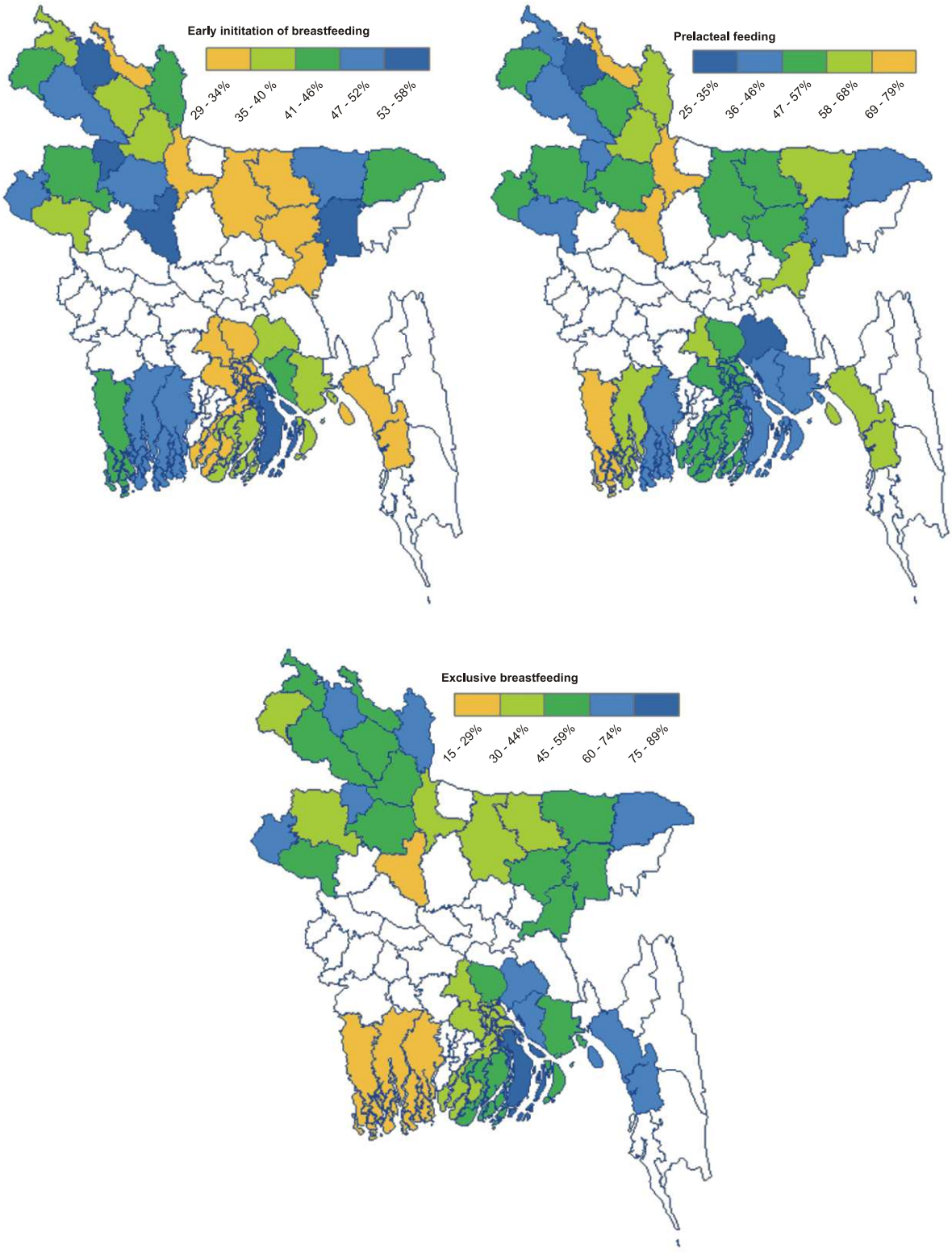
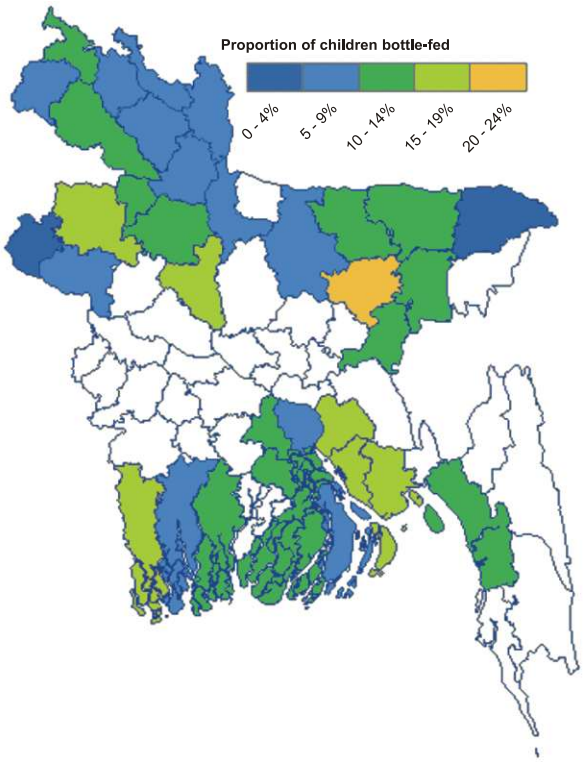
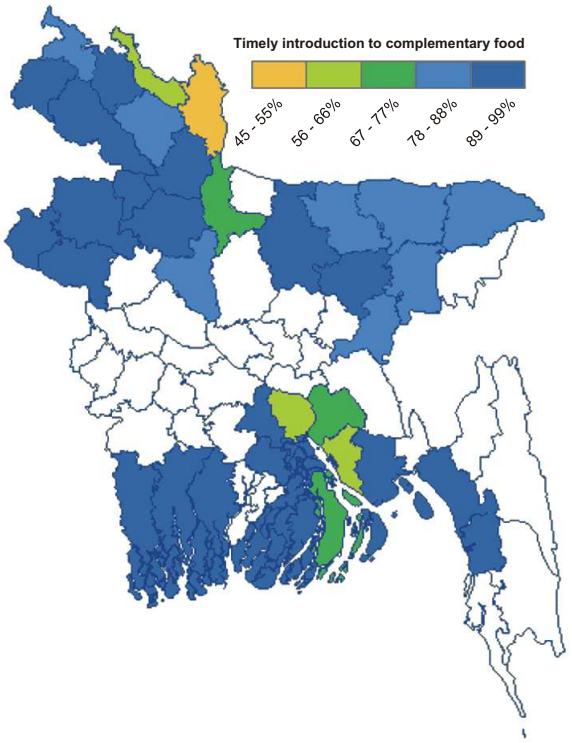
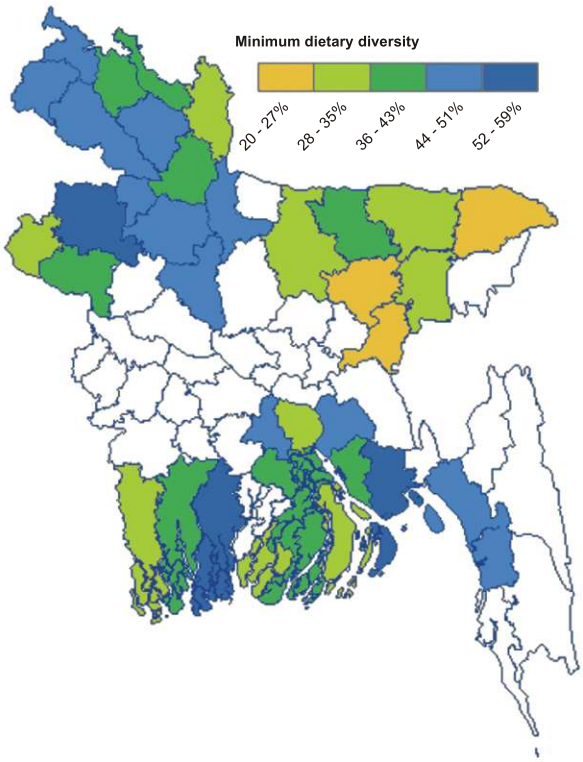


Figure 84: Complementary feeding practices by district







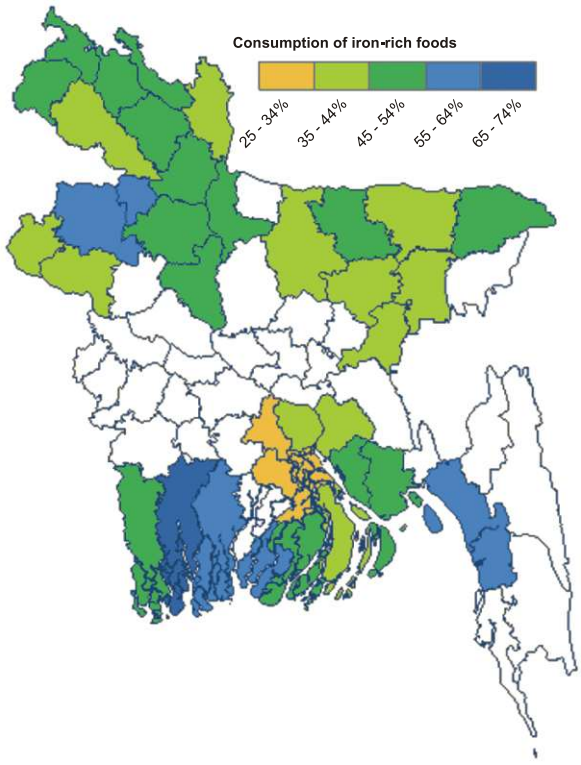


Figure 85 displays the differing proportions of children who had been sick with fever or ARI in the past two weeks in districts of Bangladesh. A greater proportion of children are ill with ARI in the east of the country from Brahmanbaria to Noakhali and Chandpur. Fever is more prevalent in the southeastern coastal districts of Chittagong, Noakhali, Lakshmipur and Bhola than it is in the southwestern coastal districts or in the northern part of the country. Gaibandha in the Northwest and Habiganj in Sylhet division also report a higher number of children suffering from fever.

Figure 85: Proportion of children sick with ARI and fever by district

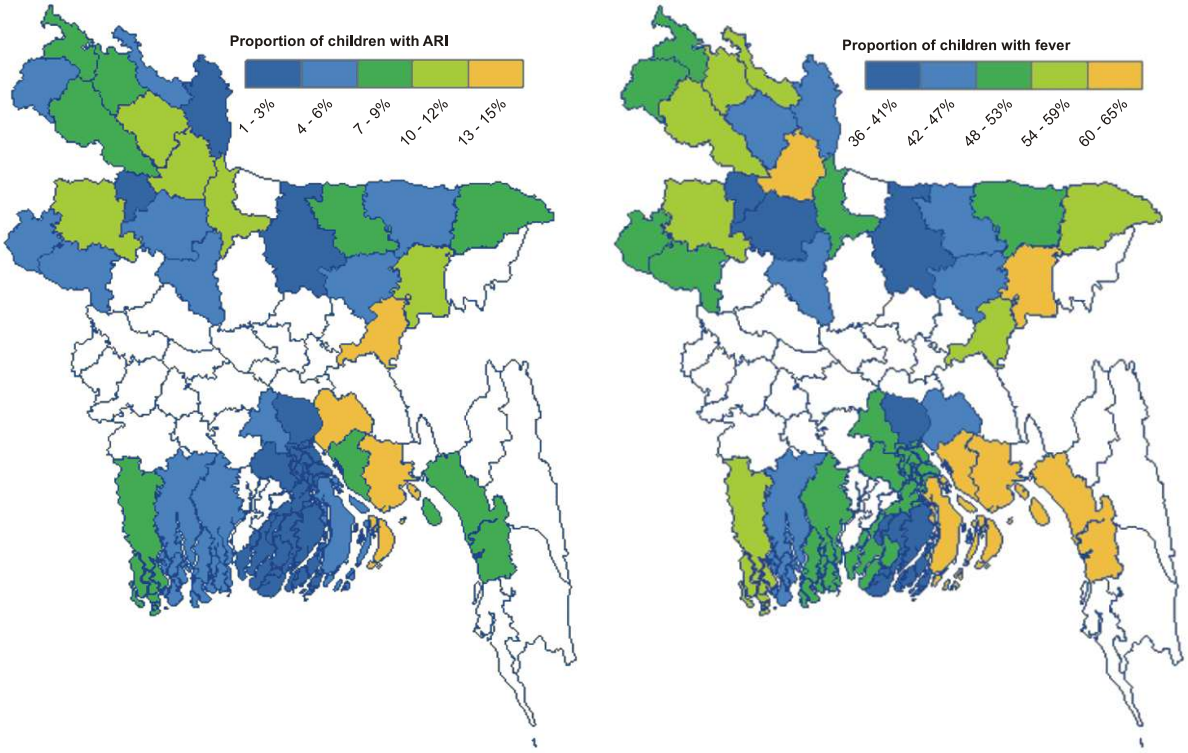
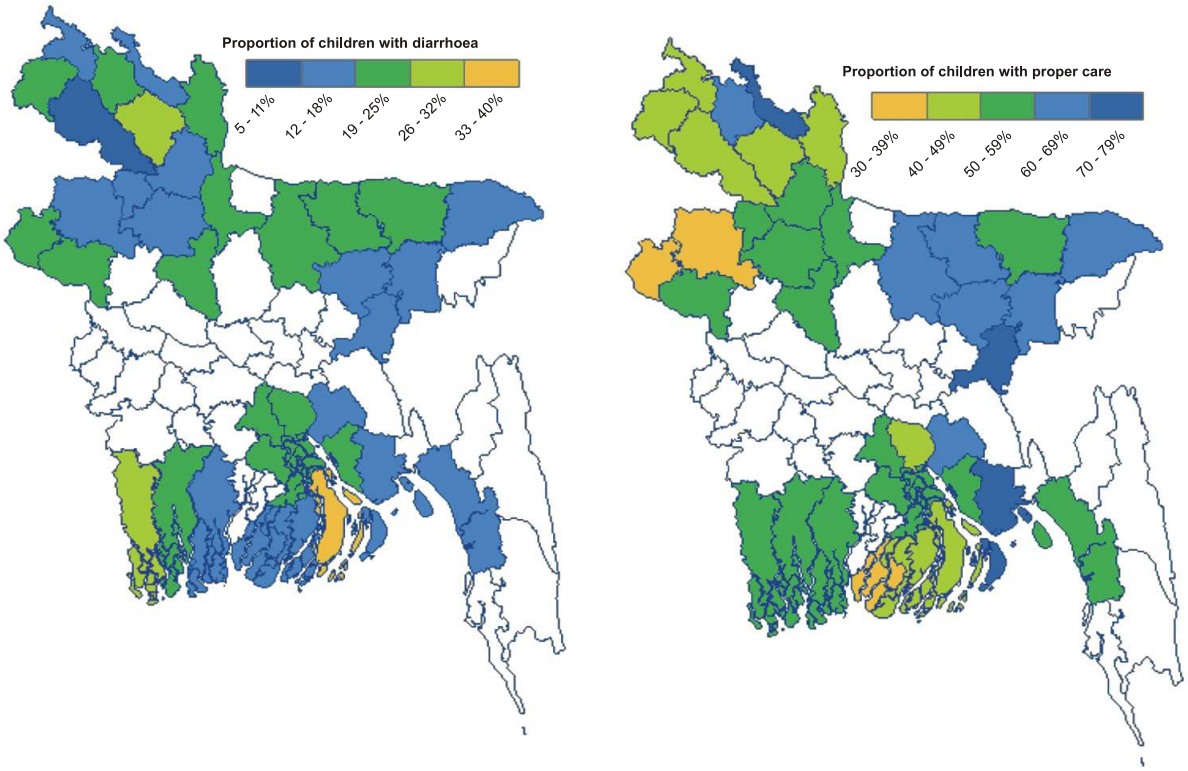


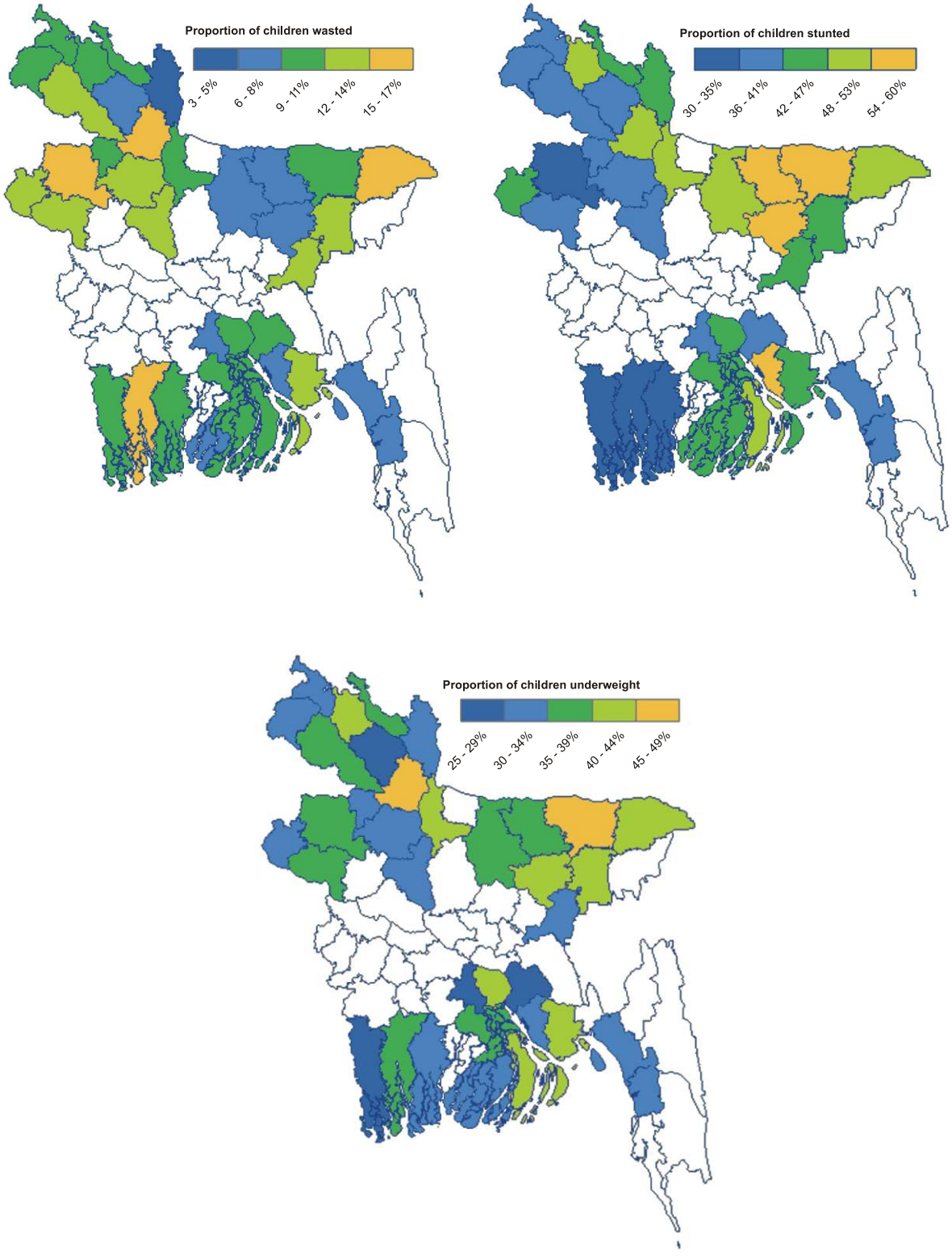
Figure 86 indicates which districts have comparatively greater proportions of children suffering from diarrhoea and which districts have adequate home-care practices. Bhola and Rangpur stand out as having high rates of diarrhoea coupled with and lower than average rates of adequate home care for this illness.

Figure 86: Proportion of children sick with diarrhea and who have received proper care by district



Rates of malnutrition vary greatly within zones and throughout the country as shown in the maps of Figure 87. Districts with high levels of wasting are scattered throughout the country, while the prevalence of stunting is much more clustered. Gaibandha and Naogaon in the northwest, Sylhet in the northeast and Khulna in the southwest stand out as having comparatively higher rates of wasting. Stunting is clustered in the heart of the Haor zone (Sunamganj, Netrakona and Kishoreganj) as well as Lakshmipur and, to a lesser extent, Bhola, in the central Coastal belt. Surprisingly, despite the high levels of food insecurity and the higher than average levels of wasting found in the southwestern Coastal belt (Satkhira, Khulna and Bagerhat), these districts have comparatively low levels of stunting.

Figure 87: Child nutritional status by district



Discussion

Results from the first year of FSNSP surveillance in Bangladesh corroborate evidence of slow but steady improvements in nutrition over the past decade. Levels of maternal and child underweight have fallen substantially, increasing numbers of pregnant women are accessing ANC to protect themselves and their children, and complementary feeding practices for young children have improved. Despite this progress, rates of maternal and child malnutrition remain unacceptably high and require sustained policy attention. Much less is known about trends in household food insecurity, however, FSNSP indicates that the problem is widespread and of growing concern in light of rising food prices.

The following constraints to sustained improvements in maternal and child nutrition and household food security require urgent attention:

Gender inequities

Given that undernourished mothers give birth to underweight children, reversing the malnutrition situation in the country may not be as straightforward as improving child-care and feeding practices. More consideration has to be given to increasing the care that women receive before conception, through to pregnancy and lactation. For example, less than a quarter of mothers receive minimally adequate antenatal care. Results indicate that a high proportion of mothers in Bangladesh are CED and that the diversity of mothers' diets remains extremely limited. Moreover, during periods of household food shortage, mothers are the first to compensate by reducing the quality and quantity of their diets.

Gender disparity remains a key factor in access to and security of adequate nutrition in Bangladesh (49). Maternal malnutrition greatly increases the risk of low birth-weight babies, which is linked to delayed and impaired child development. In addition, a woman's past experiences of extreme malnutrition can negatively impact the growth and development of the next generation even if the woman is subsequently well nourished (51; 52). Addressing these intergenerational impacts will take decades and should be given policy priority.

Women also remain severely constrained in their ability to contribute to the household economy, and they have limited control over decision-making around household expenditures, including food purchases (49). The fact that nutrition education programmes largely focus on mothers who have marginal influence in shaping the food consumption habits of a household represents a programmatic disconnect that needs to be addressed.

Lack of equitable access

At least 10 million children lived in food insecure households during 2010, and a minimum of 3.5 million children lived in households where members have had to practice severe coping behaviours such as skipping meals. The gains in health, wealth and food availability that have occurred in the past decades have not been uniform across the different geographic regions and socio-demographic groups in the country. Pockets of extreme poverty still persist in rural areas of Sylhet, Barisal, Rajshahi, and Chittagong which are characterized by low purchasing power, high rates of food insecurity, micronutrient deficiencies, maternal and child under nutrition, and poor delivery systems. When food prices rise at a faster rate than wages, as they did in 2010, those who live by daily wage are the most impacted. To date, government schemes to alleviate geographic inequalities in the multiple dimensions of poverty are dwarfed by the magnitude and diversity of needs in most areas. Even the most successful of social safety nets have only covered around half of the eligible population (53).

Limited food diversity

Linked to issues of access, limited dietary diversity in Bangladesh also poses a significant challenge to improving nutrition. The relatively low intake of non-grain food sources rich in dietary vitamins and minerals is the main reason for high levels of micronutrient deficiencies in the country. Even among mothers who have caloric sufficiency, at least half still consume a monotonous diet that lacks adequate micronutrients. Of further concern are rising rates of obesity that are also linked to changing dietary habits and lifestyles.

For rapidly growing children, micro- and macronutrients are critical to cognitive and physical development. Young children need nutrient-dense diets because the small size of their stomachs severely restricts the amount of food they can eat in a day. A child who eats predominantly starches, such as rice, will be malnourished no matter how much he/she consumes. The fact that agricultural development has focused mainly on food grain production has contributed to this problem.

Acute morbidity

Illness and malnutrition reinforce each other as part of the same vicious cycle. Sick individuals will have reduced appetites and their bodies are likely to have a reduced ability to absorb the nutrients from the food they consume, leading to malnutrition. In turn, a malnourished person has a weakened immune system and is thereby more likely to become sick. At the same time, the spikes in moderate and severe acute malnutrition (wasting) that occur each monsoon in Bangladesh are both a cause and an outcome of child illness. These spikes no doubt increase chronic malnutrition (stunting) rates.

As such, another important challenge to improving nutrition is to reduce the high prevalence of infectious diseases, particularly diarrhoea, through the wide range of proven interventions from improved water and sanitation to hand and household hygiene and more prompt and better quality health care. Community-based programmes need to address gaps between child feeding practices and WHO recommendations in tandem with recuperative care of children with moderate and severe acute malnutrition (wasting). Greater provision of improved sanitation and water facilities and communication programmes to increase hand washing and household hygiene are also needed to reduce child illness and its effects on nutrient absorption.

Moving forward

In its second year, FSNSP has expanded surveillance to include all households in Bangladesh, thus enabling the system to monitor the food and nutrition security of reproductive-aged and pregnant women, in addition to mothers and children under five years of age. This expanded surveillance capacity will enhance the ability of the system to track progress towards national development goals that are part of the SUN initiative and the Country Investment Plan and provide a greater range of data for users. The full range of data will be available to government policy-makers and partners through the FAO workstation.

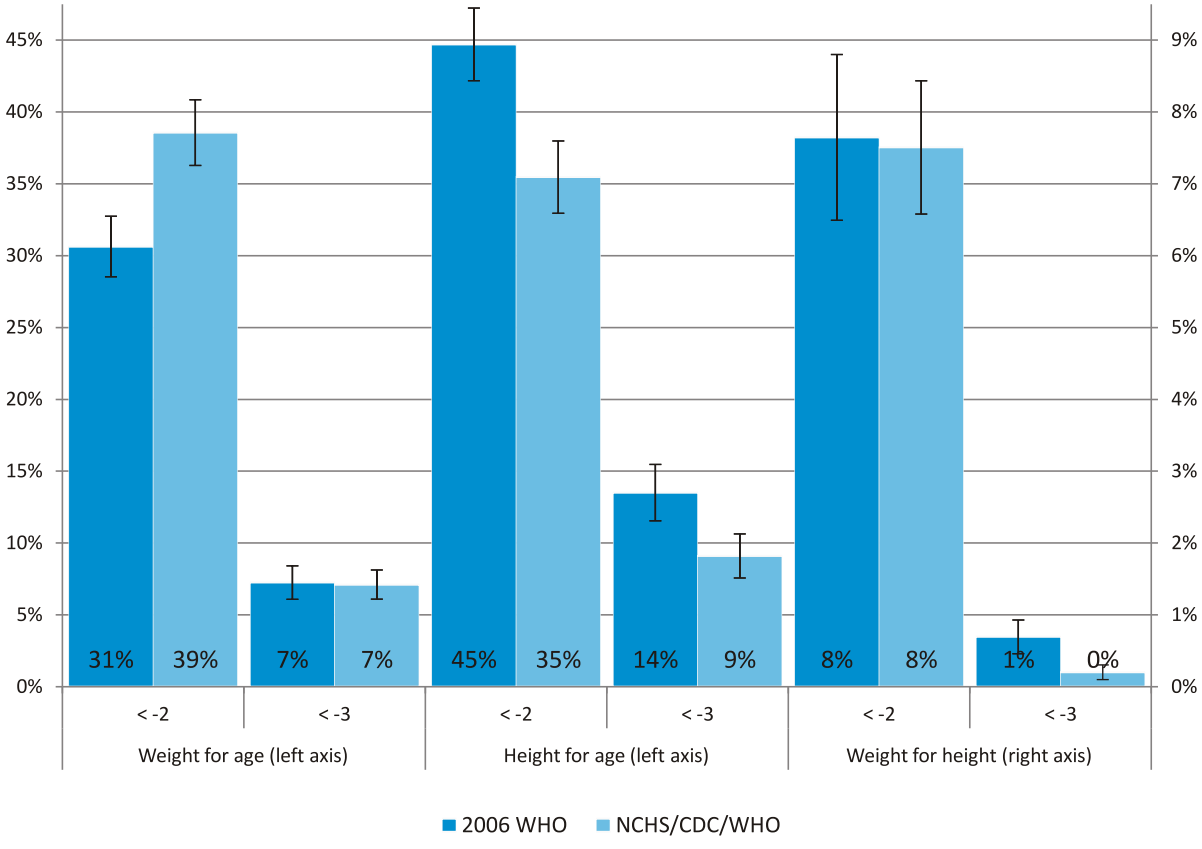
Additionally, FSNSP is working to integrate external datasets and aggregates into the surveillance system to further expand the inter-sectoral utility of the system. At the same time, FSNSP is exploring collaborative relationships with researchers within and outside Bangladesh to exploit the data collected though the FSNSP system to provide insight on the causes of malnutrition and food insecurity, and to develop new interventions to address these causes.

Appendix: Comparing estimates of childhood malnutrition (Round1)

Table 7: Comparison of estimates of childhood malnutrition (0 to 59 months, NCHS & WHO)

	2006 WHO			NCHS/CDC/WHO		
	< -2	< -3	n	< -2	< -3	n
Weight for height	7.6% *(0.065 - 0.088)*	0.7% *(0.005 - 0.009)*	12,465	7.5% *(0.066 - 0.084)*	0.2% *(0.001 - 0.003)*	12,436
Weight for age	30.6% *(0.295 - 0.327)*	7.2% *(0.061 - 0.084)*	12,493	38.6% *(0.363 - 0.408)*	7.1% *(0.061 - 0.081)*	12,484
Height for age	44.7% *(0.427 - 0.472)*	13.5% *(0.115 - 0.155)*	12,458	35.5% *(0.329 - 0.380)*	9.1% *(0.076 - 0.106)*	12,468

Figure 88: Comparison of estimates of childhood malnutrition (0 to 59 months, NCHS & WHO)



Works Cited

1. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. (1994). Bangladesh Demographic and Health Survey 1993-1994. Dhaka, BD and Calverton, Maryland, US: NIPORT, Mitra and Associates, and Macro International.
2. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. (1997). Bangladesh Demographic and Health Survey 1996-1997. Dhaka, BD and Calverton, Maryland, US: NIPORT, Mitra and Associates, and Macro International.
3. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. (2001). Bangladesh Demographic and Health Survey 1999-2000. Dhaka, BD and Calverton, Maryland, US: NIPORT, Mitra and Associates, and Macro International.
4. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. (2005). Bangladesh Demographic and Health Survey 2004. Dhaka, BD and Calverton, Maryland, US: NIPORT, Mitra and Associates, and Macro International.
5. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. (2009). Bangladesh Demographic and Health Survey 2007. Dhaka, BD and Calverton, Maryland, US: NIPORT, Mitra and Associates, and Macro International.
6. World Health Organization (WHO). (1995). WHO expert committee on physical status: The use and interpretation of anthropometry. Geneva, CH: WHO.
7. World Health Organization (WHO). (2010). Nutritional Landscape Information System (NLIS): Country profile indicators - Interpretation guide. Geneva, CH: WHO.
8. Helen Keller International. (2006). The burden of anemia in rural Bangladesh: The need for urgent action. Dhaka, BD: Helen Keller International.
9. United Nations Children's Fund (UNICEF) and the Bangladesh Bureau of Statistics (BBS). (2005). National low birth weight survey of Bangladesh 2003-2004. Dhaka, BD: UNICEF & BBS.
10. Pelletier, D. L., & Frongillo, E. A. Changes in child survival are strongly associated with changes in malnutrition in developing countries. Journal of Nutrition, 133 (1).
11. Measham, A., & Chatterjee, M. (2006). Wasting away: the crises of malnutrition in India. Washington, D.C., US: World Bank.
12. Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., et al. (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. The Lancet , 371 (9608).
13. Bangladesh Bureau of Statistics (BBS). (2008). Preliminary Report of Agriculture Census. Government of the People's Republic of Bangladesh, Planning Division, Ministry of Planning. Dhaka, BD: BBS.
14. Bangladesh Bureau of Statistics (BBS) & United Nation's Children's Fund (UNICEF). (2007b). Child and Mother Nutrition Survey of Bangladesh. Government of the People's Republic of Bangladesh, Statistics Division, Ministry of Planning. Dhaka, BD: BBS.
15. SUN. (2010). Scaling up Nutrition: a Framework for Action.
16. SUN. (2010). A Roadmap for Scaling Up Nutrition.

17. Government of the People's Republic of Bangladesh (GoB). (2011). Bangladesh country investment plan: A road map towards investment in agriculture, food security, and nutrition. Dhaka, BD: GoB.

18. Food Planning and Monitoring Unit. (14 December 2009). National Food Policy: Plan of Action (2008-2015). Dhaka, BD: Ministry of Food and Disaster Management.

19. Mason, J. B., & Mitchell, J. T. (1983). Nutritional surveillance. Bulletin of the World Health Organization , 61 (5).

20. Food and Agricultural Organization of the United Nations. (2011, March 23). Workstation (FENIX) Portal. Retrieved June 16, 2011, from Food and Agricultural Organization of the United Nations: http://www.foodsec.org/workstation/en.

21. Food and Agriculture Organization of the United Nations (FAO). (2006). Policy brief: Food security. FAO.

22. Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C., US: Food and Nutrition Technical Assistance II Project (FANTA-2), Academy for Educational Development.

23. Deitchler, M., Ballard, T., Swindale, A., & Coates, J. (2010). Validation of a Measure of Household Hunger for Cross-Cultural Use. Washington, D.C., US: Food and Nutrition Technical Assistance II Project (FANTA-2), Academy for Educational Development.

24. Maxwell, D., & Caldwell, R. (2008). The Coping Strategies Index (Second Edition). Washington, D.C., USA: Cooperative for Assistance and Relief Everywhere, Inc. (CARE).

25. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP), Institute for Public Health and Nutiriton (IPHN), & United Nations Children's Fund (UNICEF). (2009). Bangladesh Household Food Security and Nutrition Assessment Report 2009 (HFSNA). New York, US & Rome, IT: BBS, WFP, IPHN, & UNICEF.

26. Bangladesh Bureau of Statistics (BBS). (2007). Household income and expenditure survey (HIES). Government of the People's Republic of Bangladesh, Planning Division, Ministry of Planning. Dhaka, BD: BBS.

27. United Nations Children's Fund (UNICEF). (2009). Tracking progress on child and maternal nutrition: A survival and development priority. New York, US: UNICEF.

28. World Health Organization (WHO). (2006). Standards for maternal and neonatal care: Provision of effective antenatal care. Geneva, CH: WHO.

29. Arimond, M., Torheim, L. E., Weismann, D., Joseph, M., & Carriquiry, A. (2009). Dietary diversity as a measure of the micronutrient adequacy of women's diets: Results from Rural Bangladesh Site. Washington, D.C., USA: Food and Nutrition Technical Assistance Project (FANTA), Academy for Educational Development.

30. Rutstein, S. O., & Rojas, G. (2006). Guide to DHS statistics. Calverton, Maryland, US: ORC Macro.

31. WHO expert consultation. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet , 363.

32. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). (2009). WHO child growth standards and the identification of severe acute malnutrition in infants and children. Geneva, CH: WHO.

33. Bangladesh Bureau of Statistics (BBS), World Food Programme (WFP) and Bangladesh Planning Commission. (2004). The Food Security Atlas of Bangladesh. Dhaka, BD: Bangladesh Planning Commission and WFP.

34. Bartlett III, J. E., Kotrlik, J. W., & Higins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. Information Technology, Learning, and Performance , 19 (1).

36. Participants of the WHO Global Consensus Meeting on Indicators of Infant and Young Child Feeding. (2008). Indicators for assessing infant and young child feeding practices. Part 1: Definitions. Geneva, CH: World Health Organization.

37. WHO Global Consensus Working Group on Indicators of Infant and Young Child Feeding. (2010). Indicators for assessing infant and young child feeding practices. Part 2: Measurement. Geneva, CH: World Health Organization.

38. Cogill, B. (2003). Anthropometric Indicators Measurement Guide. Washington, D.C., US: Food and Nutrition Technical Assistance Project, Academy for Educational Development.

39. Haque, S. A. (2006). Salinity problems and crop production in coastal regions of Bangladesh. Pakistan Journal of Botany , 38 (5), 1359-1365.

40. Ahmed, A. (2011). Some of the major environmental problems relating to land use changes in the coastal areas of Bangladesh: A review. Journal of Geography and Regional Planning , 4 (1), 1-8.

41. World Food Programme (WFP). (2011). foodsecurityatlas.org/bgd/country/availability/agricultural-production. Retrieved 2011 19-April from foodsecurityatlas.org: http://foodsecurityatlas.org/bgd/country/availability/agricultural-production

42. Food and Agricultural Association of the United Nations (FAO). (2011). Price monitoring and analysis country brief. (September- December 2010).

43. Bangladesh Bureau of Statistics (BBS) & United Nation's Children's Fund (UNICEF). (2007). Bangladesh Multiple Indicator Cluster Survey 2006, Final Report, Volume I: Technical Report. Dhaka, BD: BBS & UNICEF.

44. Berg, C. J. (1995). Prenatal care in developing counties: The World Health Organization technical working group on antenatal care. Journal of the American Medical Women's Association , 50 (5), 182-186.

45. Measure DHS. (2010). Tablebuilder. (MeasureDHS) Retrieved January 2, 2011, from Measure DHS: Build STATCOMPILER tables: http://www.statcompiler.com/

46. Shafique, S., Akhter, N., Stallkamp, G., de Pee, S., Panagides, D., & Bloem, M. W. (2007). Trends of under- and overweight among rural and urban poor women indicate the double burden of malnutrition in Bangladesh. International Journal of Epidemiology , 36 (2).

47. Popkin, P. M. (2002). An overview of the nutrition transition and its health implications: The Bellagio Meeting. Public Health Nutrition , 5.

48. Maternal and Child Undernutrition Study Group. (2008). Maternal and Child Undernutrition Series. The Lancet .

49. Chen, L. C., Huq, E., & D'Souza, S. (1981). Sex bias in the family allocation of food and health care in rural Bangladesh. Population and Development Review , 7 (1).

50. Kraemer, S. (2000). The fragile male. British Medical Journal , 1609-1612.

51. Ramakrishnan, U., Martorell, R., Schroeder, D. G., & Flores, R. (1999). Role of intergenerational effects on linear growth. The Journal of Nutrition , Supplement (Symposium: Causes and etiology of stunting).

52. Darnton-Hill, I., Nishida, C., & James, W. P. (2004). A life course approach to diet, nutrition and the prevention of chronic diseases. Public Health Nutrition , 7 (1A).

53. Ahmed, S. S. (2007). Social safety nets in Bangladesh. Washington, D. C., USA: World Bank (background paper for Bangladesh poverty assessment).

54. FIVIMS. (2002). Making FIVIMS work for you: Tools and tips. Rome, IT: FAO.

55. Bangladesh Bureau of Statistics (BBS). (2010). Statistical Pocket Book: Bangladesh 2009. Dhaka, BD: BBS.

56. International Food Policy Research Institute (IFPRI). (2008). Validation of food frequency and dietary diversity as proxy indicators of household food security. Rome, IT: World Food Programme.

57. Swindale, A., & Bilinsky, P. (2006). Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide, Version 2. Washington, D.C., US: Food and Nutrition Technical Assistance Project (FANTA), Academy for Educational Development.

58. World Health Organization (WHO). (2011). WHO Anthro for Personal Computers Manual. Geneva, CH: World Health Organization.

List of acronyms

ANC	Antenatal Care
ARI	Acute Respiratory Infection
BBS	Bangladesh Bureau of Statistics
BDHS	Bangladesh Demographic and Health Survey
BMI	Body Mass Index
BRAC	Bangladesh Rural Advancement Committee
CDC	Center for Disease Control
CED	Chronic Energy Deficiency
CHT	Chittagong Hill Tracts
CIP	Country Investment Plan
CMNS	Child Mother Nutrition Survey
DCO	Data Collection Officer
Dfid	Department for International Development
DGHS	Director General of Health Services
DHS	Demographic and Health Survey
EC	European Commission
FANTA-2	Food and Nutrition Technical Assistance Project 2
FAO	Food and Agriculture Organization of the United Nations
FPMU	Food Planning and Monitoring Unit
FSNSP	Food Security and Nutrition Surveillance Project
FtF	Feed the Future
FWA	Family Welfare Assistant
FWV	Family Welfare Visitor
GAM	Global Acute Malnutrition
GoB	Government of Bangladesh
HA	Health Assistant
HFIAS	Household Food Insecurity Assessment Scale
HFSNA	Household Food Security and Nutrition Assessment
HHS	Household Hunger Scale
HIES	Household Income and Expenditure Survey
HKI	Helen Keller International
HNPSSP	Health, Nutrition, and Population Sector Strategy Programme
ICDDR,B	International Diarrheal Disease Research - Bangladesh
IFA	Iron and Folic Acid tablets
IPHN	Institute of Public Health and Nutrition
IYCF	Infant and Young Child Feeding
JPGSPH	James P. Grant School of Public Health
LBW	Low birth weight
MA	Medical Assistant
MDG	Millennium Development Goal
MI	Micronutrient Initiative
MICS	Multiple Indicator Cluster Survey
MoFDM	Ministry of Food and Disaster Management
MoHFW	Ministry of Health and Family Welfare
MUAC	Mid-upper Arm Circumference
NCHS	National Center for Health Statistics
NFPCSP	***National Food Policy*** Capacity Strengthening Programme
OMS	Open Market Sale
ORS	Oral Rehydration Salts
PDA	Personal Digital Assistant
PEC	Post Enumeration Check
QCO	Quality Control Officer
REACH	Renewed Efforts against Child Hunger and Malnutrition
SACMO	Sub-assistant Community Medical Officer
SAM	Severe Acute Malnutrition
SBA	Skilled Birth Attendant
SD	Standard Deviation
SMO	Senior Monitoring Officer
SUN	Scaling Up Nutrition
TBA	Traditional Birth Attendant
UN	United Nations
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

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Helen Keller International (HKI): HKI is a technical assistance agency that emphasizes building the technical and operational capacities of local government and non-governmental partners. In the past two decades, HKI has successfully designed, implemented, monitored, and evaluated more than 40 community-based, health and nutrition projects in 22 countries. During its 30 years of working in Bangladesh, HKI has provided technical leadership in nutritional surveillance, homestead food production, vitamin-A supplementation, and nutrition behavior change education.

Bangladesh Bureau of Statistics (BBS): Bangladesh Bureau of Statistics is the national statistical organization of Bangladesh. BBS collects, compiles, analyzes and publishes official statistics on all sectors of the economy to meet the needs of development planning, research, and policy. BBS has mandate of conducting the Population Census, Agriculture Census and Economic Census. Additionally, BBS's portfolio includes the Household Income & Expenditure Survey, Sample Vital Registration System, Multiple Indicator Cluster Survey, Labour Force Survey, and others.


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